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“International Approaches to Compensation for Impacts on Biological Diversity”

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Sponsored by KfW Bankengruppe and the German Federal Agency for Nature Conservation (BfN)

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List of abbreviations

ACUMAR	Matanza-Riachuelo Water Basin Authority
ANP	Natural Protected Areas (Áreas Naturales Protegidas)
ANPEC	National Association of Graduate Centers in Economics (Associação Nacional dos Centros de Pósgraduação em Economia)
APP	Permanent Preservation Areas (Áreas de Preservação Permanentes)
ARPA	Program of Protected Areas in the Amazon (Programa Áreas Protegidas na Amazônia)
BBOP	Business and Biodiversity Offsets Program
BfN	Federal Nature Conservation Agency (Bundesamt für Naturschutz)
BNatSchG	German Federal Nature Conservation Act (Bundesnaturschutzgesetz)
BNatSchGNeuregG	amendment to the German Federal Nature Conservation Act (2002)
CA	Environmental Compensation (Compensação Ambiental)
CAIXA	National Savings Bank (Caixa Econômica Federal)
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
CERFLOR	Brazilian Program of Forest Certification (Programa Brasileiro de Certificação Florestal)
CGEN	Genetic Heritage Management Council (Conselho de Gestão do Patrimônio Genético)
CIREEF	Circonscription de l'Environnement des Eaux et Forêt
COFEMA	Federal Council for the Environment (Consejo Federal de Medio Ambiente)
COGE	Management Committee (Comité de Gestion)
CONABIO	National Commission for the Knowledge and Use of Biodiversity (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad)
CONAE	National Commission on energy Savings (Comisión Nacional para el Ahorro de Energía)
CONAFOR	National Forestry Commission (Comisión Nacional Forestal)
CONAMA	National Environment Council (Conselho Nacional do Meio Ambiente)
CONANP	National Commission for Natural Protected Areas (Comisión Nacional de Áreas Naturales Protegidas)
CRD	Regional Development Committee (Comité Regional de Développement)
CRFB	Brazilian Federal Constitution (Constituição da República Federativa do Brasil)
CSP-WRI	Centre for Science in Public Participation - World Resources Institute
CTE	Technical Evaluation Committee (Comité Technique d'Evaluation)

CWA	Clean Water Act
DILIC	Environmental Licensing Department (Diretoria de Licenciamento Ambiental)
DINA	traditional Malagasy social contract designed to manage potential sources of social conflict
DIPLAN	Directorate of Strategic Planning (Diretoria de Planejamento Estratégico)
DRP	Quick Participative Diagnosis (Diagnostico Rápido Participativo)
EBY	Entidad Binacional Yacyrethá
ECF	Environmental Compensation Fund
EEAA	Egyptian Environmental Affairs Agency
EES	Strategic Environmental Assessment (Evaluation Environnementale Stratégique)
e.g.	for example
EIA	Environmental Impact Assessment
EIE	Environmental Impact Study (Etude d'Impact Environnementale)
EMAS	Eco-Management and Audit Scheme
EMBRAPA	Brazilian Company for Agricultural and Animal Husbandry Research (Empresa Brasileira de Pesquisa Agropecuária)
EMP	Environmental Management Plan
EMU	Environmental Management Unit
EIS	Environmental Impact Study
ERF	Economic Research Forum
ESIA	Environmental and Social Impact Assessment
ESSE	Strategic Social and Environmental Assessment (Evaluation Stratégique Sociale et Environnementale)
ETV	Economic Total Value
FAEP	Framework Act on Environmental Policy
FANL	Fundamental Act of National Land
FAP	Protected Areas Fund (Fundo de Áreas Protegidas)
FCA	Environmental Compensation Fund (Fundo de Compensação Ambiental)
FEMA	State Environment Fund (Fundo Estadual do Meio Ambiente)
FNMA	National Environment Fund (Fundo Nacional de Meio Ambiente)
FOREAIM Project	Forest Restoration in Eastern Africa, Indian Ocean Islands and Madagascar / Bridging restoration and multi-functionality in degraded forest landscape of Eastern Africa and Indian Ocean Islands)
FPNPA	Federal Program for Natural Protected Areas

FUNBIO	Brazilian Biodiversity Fund (Fundo Brasileiro para Biodiversidade)
GDP	Ground Disturbance Permit
GEC	Executive Coordinating Group (Comité Exécutif du Groupe)
GEF	Global Environment Facility
HD	Habitats Directive
IAIA	International Association for Impact Assessment
IBAMA	Brazilian Institute of Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis)
IBGE	Brazilian Geography and Statistics Institute (Instituto Brasileiro de Geografia e Estatística)
ICMBio	Chico Mendes Institute for Biodiversity Conservation (Instituto Chico Mendes de Conservação da Biodiversidade)
ICMM	International Council on Mining and Metals
ICMS	State Value-added Tax on Sales and Services (Imposto sobre Circulação de Mercadorias e Serviços)
ICP	Integrated Compensation Programme
i.e.	that is
IEF	State Forestry Institute (Instituto Estadual de Florestas)
IMR	Impact Mitigation Regulation
INAI	National Institute for Indigene Interests (Instituto Nacional de Asuntos Indígenas)
INE	National Institute of Ecology (Instituto Nacional de Ecología)
Integrated IA Act	Impact Assessment Act on Environment, Transportation and Natural Disasters
IP	Preventive Report (Informe Preventivo)
IUCN	International Union for Conservation of Nature
KfW Bankengruppe	KfW Banking Group (proper name)
LFR	Legal Forest Reserves
LGA	Environmental Framework Law (Ley General del Ambiente)
LGEEPA	General Act on Ecological Equilibrium and Environmental Protection (Ley General del Equilibrio Ecológico y la Protección al Ambiente)
LI	Construction License (Licença de Instalação)
LO	Operation License (Licença de Operação)
LP	Previous License (Licença Previa)
LPNMA	National Environmental Policy Act (Lei da Política Nacional do Meio Ambiente)
MAP	Madagascar Action Plan

MCEP	Mining Certification Evaluation Project
MEC	Adaptation of Conformance (Mise en conformité)
MECIE	Compatibility of Investment with the Environment (Mise en Compatibilité des Investissements avec l'Environnement)
MIA	Environmental Impact Assessment (Manifestación de Impacto Ambiental)
MMA	Ministry of the Environment (Ministério do Meio Ambiente)
MOE	Ministry of Environment
MSB	Millennium Seed Bank
NCA	Environmental Matching Funds Center (Núcleo de Compensação Ambiental)
NEPA	National Environment Protection Agency
NEPA	National Environmental Policy Act (USA)
NGO	Nongovernmental organisation
NSW	New South Wales
ONE	National Office for the Environment (Office National de l'Environnement)
PAB	Biodiversity Action Plans (Planes de Acción de Biodiversidad)
PAE	Environmental Action Plan (Plan d'Action Environnementale)
PAS	Argentine Sustainability Programme (Programa Argentina Sustentable)
PEMP	Project Environmental Management Plan
PERS	Prior Environmental Review System
PFE	Procuradoria Federal Especializada
PGEP	Project Environmental Management Plan (Plan de Gestion Environnementale du Projet)
PGRM	Projet de Gouvernance des Ressources Minerales de Madagascar
PMB	Biodiversity Monitoring Plans (Planes de Monitoreo de Biodiversidad)
PMMG	Polícia Militar de Minas Gerais (Military Police of Minas Gerais)
PPBio	Biodiversity Research Program (Programa de Pesquisa em Biodiversidade)
PPG7	Pilot Program to Conserve the Brazilian Rainforests
PPMA	Project for the Preservation of the Atlantic Forest (Projeto de Preservação da Mata Atlântica)
PREE	Environmental Commitment Programme (Programme d'engagement environnemental)
PROBEM	Brazilian Program of Bio-prospection and Sustainable Development of Biodiversity Products (Programa Brasileiro de Bioprospecção e Desenvolvimento Sustentável de Produtos da Biodiversidade)

PROBIO	Project for the Conservation and Sustainable Use of Brazilian Biological Diversity (Projeto para a Conservação e Utilização Sustentável da Diversidade Biológica Brasileira)
PROFEPA	Federal Administration of Environmental Protection (Procuraduría Federal de Protección al Ambiente)
PROMATA	Programa de Apoio ao Desenvolvimento Sustentável a Zona da Mata de Pernambuco (Atlantic Forest Protection Project of Minas Gerais)
PRONABIO	National Biodiversity Program (Programa Nacional da Diversidade Biológica)
PRONAF	Programa Nacional de Fortalecimento da Agricultura Familiar
PROVARZEA	Natural Resources Project (Projeto Manejo dos Recursos Naturais da Várzea)
PSA-CABSA	Program for Payments for Environmental Services (Pago por Servicios Ambientales de Captura de Carbono, Conservación de la Biodiversidad y Derivados Agroforestales)
PU	Management Plans for Productive Family Units (Planos de Utilização das Unidades de Produção)
QMM	QIT Madagascar Minerals
RBO	Regional Branch Office
RIMA	Environmental Report (Relatório de Impactos Ambientais)
RPPN	Private Natural Heritage Reserves (Reservas Particulares do Patrimônio Natural)
SAPM	Protected Areas System of Madagascar (Système des Aires Protégées de Madagascar)
SEA	Strategic Environmental Assessment
SEAM	Programme of Support for Environmental Assessment and Management
SEIA	Social and Environmental Impact Assessment
SEMAD	State Secretary of the Environment and Sustainable Development (Secretaria de Estado de Meio Ambiente e Desenvolvimento Sustentável)
SEMARNAT	Ministry for the Environment and Natural Resources (Secretaría de Medio Ambiente y Recursos Naturales)
SEMP	Sectoral Environmental Management Plan
SGA	Environmental Management Systems (Sistemas de Gestión Ambiental)
SISNAMA	National Environment System (Sistema Nacional do Meio Ambiente)
SLCP	Sloping Land Conversion Program
SME	Environmental Management System (Système de Management Environnemental)

SNUC	National System of Conservation Units (Sistema Nacional de Unidades de Conservação)
SSEA	Strategic Social and Environmental Assessment
TC	Agreement Term (Termo de Concordância)
TCp	Commitment Term (Termo de Compromisso)
TE	Closure Term (Termo de Encerramento)
UC	Unit of Conservation
UMA	Management Units for the Conservation and Sustainable Use of Wildlife Unidades de Manejo para la Conservación y Aprovechamiento Sustentable de la Vida Silvestre
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
UVPG	Environmental Impact Assessment Law (Umweltverträglichkeitsprüfungsgesetz)
VAT	Value-added Tax
VCO	Quasi-optional Value (Valor de Cuasi Opción)
VE	Value of Existence (Valor de Existencia)
VET	Economic Total Value (Valor Económico Total)
VL	Heritage Value (Valor de Legado)
VO	Optional Value (Valor de Opción)
Vs.	versus
VUD	Direct Use Value (Valor de uso directo)
VUI	Indirect Use Value (Valor de uso indirecto)
WCA	Wetland Conservation Act

1 Introduction

Project rationale

The starting point of this research project is the UN Convention on Biological Diversity (CBD). Through the ratification of the CBD, member countries have made a commitment to support the conservation of biological diversity. In the sixth Environment Action Programme 2001 – 2010 (“Our Future, Our Choice“) the European Union established the preservation of biodiversity as a central aim of European environmental politics and subsequently established a European Biodiversity Strategy. Germany is a contracting party to the CBD and has recently enacted and defined its National Biodiversity Strategy.

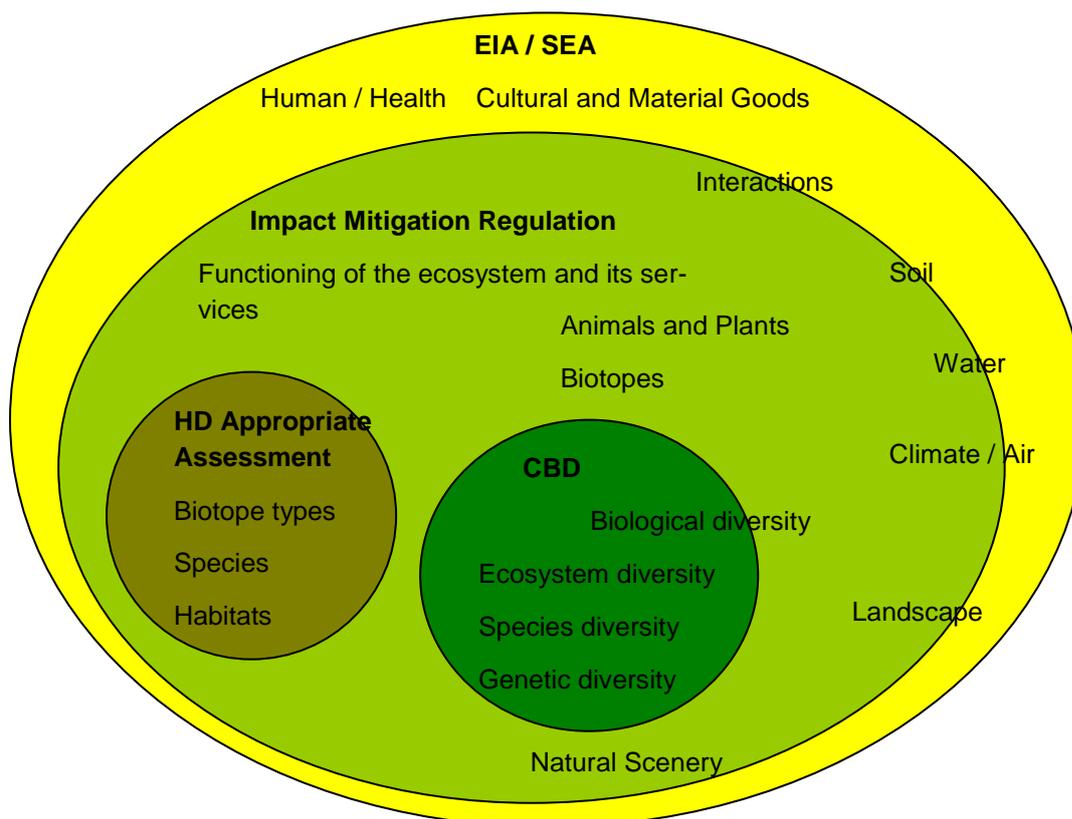


Figure 1: Interaction of different impact mitigation regulation tools

Source: modified after Bundesamt für Naturschutz 2007: 39.

One of the measures of the convention is a resolution to introduce “appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects” (Article 14 1a). Discussions are ongoing regarding how the requirements of the CBD can be integrated into existing instruments used to assess the impacts of plans and projects, e.g. Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), assessments required under the Habitats Directive, German Impact Mitigation Regulation (Eingriffsregelung) and so on. In the case of Germany, the question is to what degree the Eingriffsregelung already accomplishes the goals of the CBD and what must be done to make further improvements. The situation in Germany thus provides a suitable example for wider discussion in a global arena (Peters 2003: 1). In turn, discussions and interactions between interested parties in the global arena may have implications for the ongoing process to modernise and

consolidate German nature conservation law into an environmental code. One of the core issues relates to avoidance, mitigation and compensation of impacts on nature and biological diversity and how the respective measures can be developed, balanced and implemented.

Study context

German National Biodiversity Strategy

In November 2007, the Federal Government passed its National Biodiversity Strategy, which has been developed under the leadership of the Federal Ministry for the Environment. As a result, for the first time, a comprehensive and ambitious strategy is in place for the implementation of the goals and measures of the CBD. In December 2007 the Federal Ministry for the Environment began a broad implementation process that will last several years and that aims to ensure the participation of all relevant stakeholders. This will be realised through large national and regional forums on biological diversity and several dialogue forums with specific actors. The first national forum on biological diversity, which took place 5-6 December 2007 in Berlin, officially initiated the implementation process. Between January and June 2008 a total of seven regional forums were held, relating to different aspects of the National Biodiversity Strategy. A second national forum is planned for January 2009.

Conference of the Parties (COP9) in Germany

The present study has been undertaken in the context of the 9th Conference of the Contracting Parties (COP9) to the CBD, which has been a major focus for the main activities of the Federal Ministry for the Environment, the Federal Agency for Nature Conservation (BfN) and other institutions concerned with nature conservation. In parallel to the COP9 in Bonn, the third symposium 'Urban Biodiversity & Design' was held in Erfurt in May 2008, organised by the Competence Network for Urban Ecology.

With the aim of sharing the experiences with different instruments to address environmental impacts and the respective compensation approaches, first results of the study were presented within the scope of the forum of the Federal Agency for Nature Conservation at the COP9 in Bonn.

The fact that the implementation of compensation requirements of the CBD is discussed world-wide finds its expression especially in the activities of the BBOP working group of the IAIA.

Business and Biodiversity Offsets Program (BBOP)

The Business and Biodiversity Offsets Program is a partnership of companies, scientists, NGOs, government agencies, research institutes, and financial institutions, which focuses on the question of compensation for impacts on biological diversity, in response to a growing interest in the field.

Members of the BBOP network made presentations in the "Conservation and Economic Development: The Role of Biodiversity Offsets" forum (part of the 27th IAIA Congress held in Seoul in June 2007). Kerry ten Kate (BBOP Director), Deric Quaille (at the time seconded from Shell to IUCN) and Jonathan Ekstrom (specialist consultant on biodiversity issues) spoke on possibilities, methods and recommendations for action in the context of compensating for impacts on biological diversity. It was noted (by Jonathan Ekstrom) that a strong international interest exists in particular regarding the question of the definition and balancing of biodiversity offsets. In this regard, BBOP aims to mainstream the concept of "no net loss" of biodiversity into development projects through "conservation activities that will protect threatened habitat, contribute to national biodiversity strategies and address local communities' livelihood priorities" (BBOP 2008: n.pag.). During the first phase, which comes to an end in early 2009, the main objectives of BBOP have been to develop, test and disseminate guidance for designing and implementing biodiversity offsets. As part of this process, the BBOP Secretariat identified several pilot projects and is currently preparing a methodology toolkit. First drafts of a series of biodiversity offset handbooks have recently been posted for public review in an online consultation process, and revised

documents taking into consideration the results of this consultation are expected to be made public in early 2009.

Through a mutual exchange of information, the work of BBOP contributed to the development of this study, and the outcomes of this study have been fed into the BBOP consultation process.

BBOP BUSINESS AND BIODIVERSITY OFFSETS PROGRAM

HOME BIODIVERSITY OFFSETS SECRETARIAT ADVISORY COMMITTEE LEARNING NETWORK LIBRARY PILOT PORTFOLIO TOOLKIT CONSULTATION CONTACT US

The Business and Biodiversity Offset Program (BBOP) is a partnership between companies, governments and conservation experts to explore biodiversity offsets. We are:

- Demonstrating conservation and livelihood outcomes in a portfolio of biodiversity offset pilot projects;
- Developing, testing, and disseminating best practice on biodiversity offsets; and
- Contributing to policy and corporate developments on biodiversity offsets so they meet conservation and business objectives.

The BBOP partners wish to show, through a portfolio of pilot projects in a range of industry sectors, that biodiversity offsets can help achieve significantly more, better and more cost-effective conservation outcomes than normally occurs in infrastructure development. The BBOP partners also believe that demonstrating no net loss of biodiversity can help companies secure their license to operate and manage their costs and liabilities.

Our vision and expectation is that biodiversity offsets will become a standard part of business practice for those companies with a significant impact on biodiversity. The routine mainstreaming of biodiversity offsets into development practice will result in long-term and globally significant conservation outcomes.

We thank our current sponsors:

ALCOA FOUNDATION Australia Government Department of the Environment, Water, Heritage and the Arts USAID FROM THE AMERICAN PEOPLE IFC VROM kfw BANKENGRUPPE

Richard and Rhoda Goldman Fund

ANNOUNCEMENTS
BBOP Newsletter - Sept. 2008

To view and comment on a list of potential BBOP Phase 2 work priorities beginning in 2008, [click here](#).

Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development and persisting after appropriate prevention and mitigation measures have been implemented. The goal of biodiversity offsets is to achieve no net loss, or preferably a net gain, of biodiversity on the ground with respect to species composition, habitat structure and ecosystem services, including livelihood aspects.

Program Flyer: A brief printable overview of the BBOP program. [See also: Ecosystem Marketplace](#)

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Figure 2: BBOP Website

Source: Business and Biodiversity Offsets Program (2008). Available at: <http://www.forest-trends.org/biodiversityoffsetprogram/index.php>. Accessed: 20.10.2008.

Study objectives

The knowledge of how other countries in the European Union and worldwide are coping with the issue of avoiding, mitigating and most notably compensating for impacts on biological diversity is rather fragmented. Indeed, a study on the question of impact mitigation was undertaken on behalf of the German Federal Agency for Nature Conservation in 2003 (Peters et al. 2001; Peters et al. 2002). However, this research did not make specific reference to the CBD. The present study therefore aims to incorporate specifically issues raised by the CBD by analysing CBD-relevant national documents, such as National Reports, Biodiversity Strategy and Actions Plans and other biodiversity targets and policies. Furthermore it aims to have a global geographical scope, thus complementing the previous study (Peters et al. 2001; Peters et al. 2002), which concentrated on a comparison of the member states of the European Union, Switzerland, the USA and Canada.

The goal of this study is to identify and compare compensation approaches taken with respect to impacts on biological diversity in selected countries from four different continents: Africa, Asia, North America and South America. With regard to the future development of German and international impact mitigation and compensation the focus lies not only on approaches that are already being implemented, but also those that are currently under discussion. The study aims to give an exemplary overview of possible approaches to compensation rather than an in-depth review. In this context, the Internet was identified as the most appropriate medium for the research.

Beside the presentation of compensation approaches worldwide, the study aims to promote the existing German instruments, most notably the Eingriffsregelung. On one hand the considerations and achievements of other compensation approaches and instruments may be incorporated into the advancement of the Eingriffsregelung, while on the other hand, based on extensive experience gained over many years, the Eingriffsregelung may serve as an example for other countries.

Research issues / questions

1) Scope and objectives

- What are the goals of IMR?
- What are the principles of IMR?
- What is the rationale behind the country's IMR?
- What are the subjects of regulation: ecosystems, landscape, biodiversity, human health etc?

2) Components of biodiversity and natural resources covered / measured

Regarding planning processes and implementation / operation (impact assessments, reviews and monitoring):

- Which indicators and parameters are used to assess impacts on biodiversity?
- Which components and values are used to assess impacts on biodiversity?

3) Methods for valuation and quantification of potential impacts

- Does IMR provide methods, recommendations or guidance on how to predict and analyse impacts of projects and regional plans on biodiversity?
- Does IMR provide methods, recommendations or guidance on how to predict and solve conflicts between conservation / sustainable use of biodiversity and expected impacts?
- Does IMR provide methods, recommendations or guidance on how to integrate socio-economic aspects and interactions (for instance indigenous peoples)?
- Does IMR provide methods, recommendations or guidance on how to integrate health aspects into the assessment?

4) Determining significance and thresholds

- Does IMR provide principles, recommendations, guidance or scientific criteria for offsettable / not offsettable impacts?
- Does IMR provide principles, recommendations, guidance or scientific criteria for irreplaceability?
- Does IMR provide principles, recommendations, guidance or scientific criteria for determining the significance of the impact?

5) Mitigation hierarchy

- Does IMR include principles and guidance to avoid, reduce and repair harm to biodiversity?
- Which actions / measures are recommended / stipulated?
- What are used as criteria to determine the extent to which the mitigation hierarchy has to be followed in order to prevent a "licence to trash" scenario?

6) Determining offset demand

- Does IMR include principles and guidance to compensate harm to biodiversity?
- How are compensation measures designed and quantified regarding time, function and space? (type of offset: in-kind / out-of-kind, real compensation vs. pay-and-forget, measurable conservation outcomes vs. "pseudo-compensation", regional aspects: on-site / off-site, eco-regional restrictions, implementing offset-sites into a broader (eco-) regional- / landscape-context, handling of additionality and leakage, compensation ratio, handling of time-lag)

7) Implementation and responsibilities

- Who bears the costs?
- Who implements offsets (developer, third parties such as compensation agencies)?
- How to assure long-term sustainability (management, finance)
- Who decides and approves offset plans (local / regional / national administration)?

2 Fundamentals / Principles of Impact Mitigation Regulation

The central focus of this study is how impacts on the environment and in particular on biological diversity are addressed and which methods or instruments are used to accomplish this task. Below, the terms **compensation approaches** and, referring to German nature conservation law, **Eingriffsregelung (impact mitigation regulation)** are used. In general, it is possible to distinguish between comprehensive and selective approaches, the latter exhibiting a restricted application to certain areas (such as wetlands or protected areas) (Peters et al. 2001: 12). By contrast, the German Eingriffsregelung follows a comprehensive approach applied to the total area, independent of its value in terms of biological diversity (Peters et al. 2001: 12).

Impact mitigation and **biodiversity offset** schemes usually follow a three step **mitigation hierarchy**. This adherence to the mitigation hierarchy implies that one should in a first instance seek to **avoid** or prevent negative impacts on the environment in general and biological diversity in particular. Secondly, the unavoidable impacts should be addressed through **minimisation** and rehabilitation measures and only as a **“last resort”** should **compensation** measures be established for the **residual adverse impacts** (BBOP n.d.: 4) (see Figure 3). This can be done either by restitution or by compensation payment.

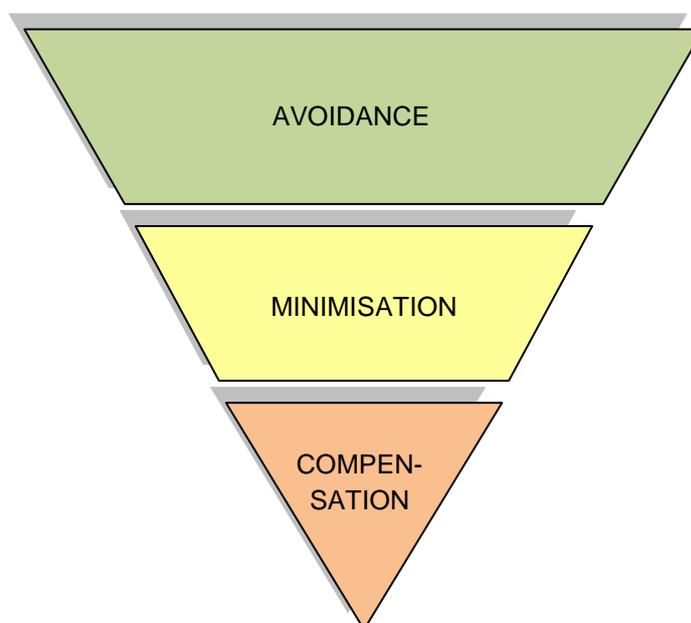


Figure 3: Mitigation hierarchy

Generally, the goal of avoiding impacts or nuisances on biological diversity can be implemented in different legal and political, and methodological structures, which vary from one country to another. With respect to minimisation and mitigation, procedural, ecological and technical issues have to be taken into consideration. The obligation to compensate for the residual adverse impacts may be linked to the possibility of a **compensation payment** in monetary terms, or the procurement and management of compensation areas and measures in **fund and pool models**. Finally, compensation measures should be (but are not always) subject to **monitoring** and **follow up**, to assure their effectiveness (Peters et al. 2001: 11).

Given the need to follow a mitigation hierarchy, it is important to note that offsets cannot provide a justification for proceeding with projects for which the residual impacts on biodiversity are unacceptable (BBOP n.d.: 4). This means that the **“no go”** option has to be considered seriously and applied in

cases where the destruction of unique habitats, or irreversible loss etc would otherwise occur (Bishop 2006, p. 9).

This study focuses on the last step of the mitigation hierarchy (apart from monitoring and follow up): **compensation** or **offsets** (both terms being used similarly in the scope of the study). Biodiversity offsets are defined as “conservation actions intended to compensate for the residual, unavoidable harm to biodiversity caused by development projects, so as to ensure **no net loss** of biodiversity” (Escorcio Bezerra 2007: 7). Thus, biodiversity offsets are counterbalancing activities, seeking environmental gains to counter environmental damages, in order to achieve a net neutral or beneficial outcome (Escorcio Bezerra 2007: 7). In this respect, “no net loss” refers to the goal of restoring the state prior to the impact, and thus, maintaining the same level of biodiversity, whereas the **net gain** approach aims at improving biodiversity quality (Escorcio Bezerra 2007: 10). However, in practice the concept of “no net loss” is most often encountered, but there may be differences in the scope of the components being considered. Ideally, abiotic and visual components and functions of the environment as well as biological components will be taken into consideration. Following the “no net loss principle”, biodiversity offsets should result in measurable compensation outcomes, beyond that which would have occurred in the absence of the offset activities (BBOP n.d.: 4f). This requirement of **additionality** implies that offsets cannot replace conservation and other obligations, for example those of environmental authorities.

Biodiversity offsets should be planned and implemented in accordance with the CBD (BBOP n.d.: 4). The provisions of Article 6 (a) and (b), Article 8 (c), Article 10 (a) and particularly those of Article 11, on incentive measures, and **Article 14 (2)**, specifically referring to “compensation”, serve as legal basis for the development of national frameworks for biodiversity offsets (Escorcio Bezerra 2007: 9).

Prior to the definition and implementation of compensation measures, the impacts on biological diversity have to be measured. The appropriate **measurement of impacts** requires the establishment of the **environmental baseline** and the identification of all **key biodiversity components** that are impacted, taking into consideration the hierarchical levels of biodiversity, for instance, species, biotic communities and ecosystem processes (BBOP n.d.: 5). The measurement of impacts gives rise to a number of challenges:

- In addition to primary impacts, secondary and cumulative impacts may occur (Grigg 2006: 8; BBOP n.d.: 5).
- Quantifying project impacts may be difficult due to an incomplete knowledge of biodiversity and ecosystem functions and services (BBOP n.d.: 12).
- The valuation of impacts on biological diversity is complicated due to the fact that different groups in society attach different values to biodiversity components (BBOP n.d.: 12).

When offsets are designed, these have to be placed close to the impact site. The central question is whether offsets can provide biodiversity and livelihood benefits that are comparable to the affected ecosystem (Bishop 2006: 9). In this respect, the **comparability** and the compensation ratio are important criteria. The former refers to the fact that offsets may be either “**like-for-like**” or “**like-for-better**”, which means substituting a less valuable asset with an asset that is more valuable in terms of either its quality or quantity) (Suvantola n.d.: 5), the latter refers to the need to calculate the amount of biodiversity lost through the project and that gained by the offset (BBOP n.d.: 20). Usually preference should be given to like-for-like offsets with a compensation ratio of 1:1 or more. However, the 1:1 ratio has been strongly criticised because it does not take into consideration the time lag between the impact and the maturity of appropriate offsets and the risk that these may fail (Suvantola n.d.: 5). Instead, the establishment of an appropriate offset ratio builds on several factors:

- the chosen compensation mechanism (e.g. restoration, preservation),

- the equivalence of the offset or the **functional relationship** (in kind vs. out of kind),
- the conservation significance (unique vs. common),
- the location of the offset or the **spatial relationship** (on site vs. off site, in / out of watershed, eco-region, or service area),
- the time lags between project impacts and offset maturity or **the temporal relationship**, and
- the risks of offset failure (Biodiversity Neutral Initiative 2005: 37).

In this spirit, “more developed offset policies clearly support establishing a **currency** (debit / credit unit) that incorporates the values associated with ecological functions, quality, and integrity, rather than simply using acreage / hectare units. But detailed guidance on how to establish such a currency is seldom provided. As a result, a plethora of assessment methods have been developed for establishing currency units (especially for wetlands), based on differing local contexts, varying criteria, and differences in professional judgment” (Biodiversity Neutral Initiative 2005: 37). Thus, it is advisable or required that the offset covers an area greater than the affected area in order to achieve the goal of “no net loss of biodiversity” (BBOP n.d.: 17).

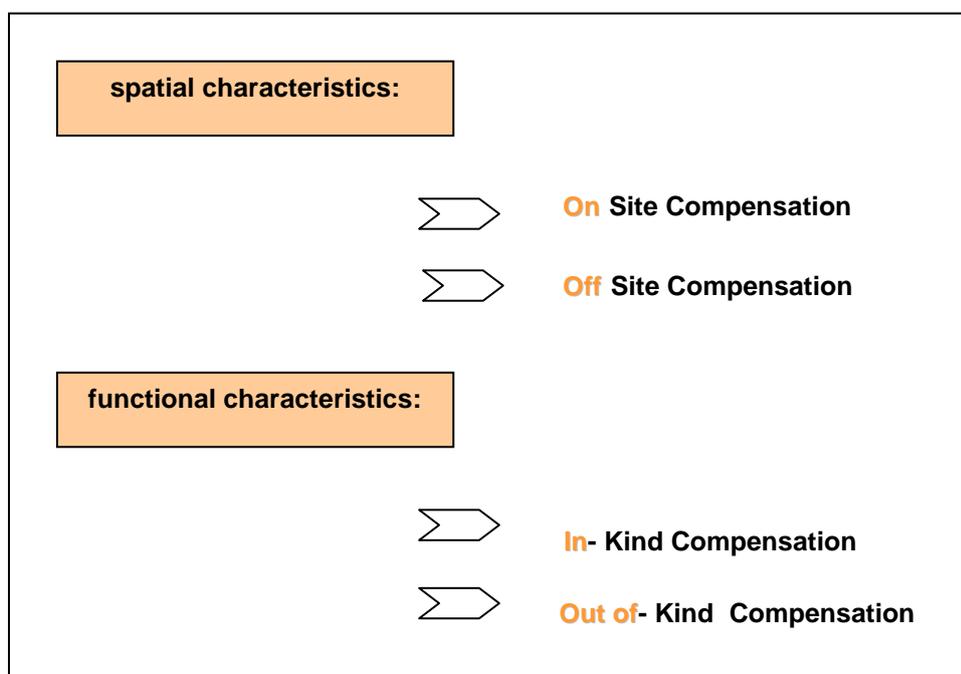


Figure 4: Characteristics of compensation

According to the **functional relationship** of impacts and offsets, as mentioned above, **in kind** compensation (like-for-like) is generally prioritised over **out of kind** compensation (like-for-not-like). This is considered particularly important when the affected area is of high local relevance (Biodiversity Neutral Initiative 2005: 32). Whereas in kind compensation refers to measures that are equal to the lost area with respect to habitats, functions, values or other attributes, out of kind compensation means measures that do not have a functional relationship with the impacted site (i.e. other areas and / or functions).

Despite the preference for in kind offsetting, out of kind measures are becoming more acceptable, as long as they can generate a greater environmental benefit (like-for-better or “**trading-up**”) (Biodiversity Neutral Initiative 2005: 33).

The functional relationship of impacts and offsets is closely linked to their **spatial relationship**. Whereas **on site** compensation includes measures in the impact area or nearby, **off site** compensation is spatially disconnected from the impact area. Usually, on site measures are preferable to off site measures, based on the principle that compensation should occur in the affected area (Biodiversity Neutral Initiative 2005: 33). However, in practice this is not always feasible or appropriate, as most projects with significant adverse impacts cause to some extent an alteration of the affected area, which makes it impossible to implement adequate functional (in kind) compensation measures directly in the affected area (Peters et al. 2001: 17). Furthermore, the geographical extent of what is considered to be on site offsetting is not clear, and therefore has to be defined. In the context of the US Wetland Mitigation (see chapter 3), experts propose the use of watersheds (Peters et al. 2001: 17), while more narrow approaches tend to see offsetting within the same watershed or eco-region as off site measures (Biodiversity Neutral Initiative 2005: 35). The use of 'watershed' terminology to define on site / off site is not appropriate for all landscapes (e.g. drylands) and has to be further differentiated for larger streams. Therefore emphasis has to be laid on establishing an adequate definition of 'on site' with respect to the spatial and functional relationships with the affected area. BBOP is aiming to develop and implement biodiversity offset methodologies that consider the "**landscape context**", "taking into account available information on the full range of biological, social and cultural values of biodiversity and supporting an ecosystem approach" (BBOP n.d.: 4). Still, this is not precise enough and requires more specific spatial delimitation, e.g. English Nature's Natural Areas or Joint Character Areas (Latimer; Hill 2008: n. pag.). Another issue to consider is the **scale** of the offset, i.e. that "small sites can require a disproportionate effort of management in order to maintain their ecological interest and mitigation costs for separate developments can also be higher where administration and management are replicated both spatially and over time in separate commissions for the same target habitat or species" (Latimer; Hill 2008: n. pag.). Furthermore, **landscape and habitat pattern** may play an important role in ensuring efficient and adequate compensation measures (Core sites, Green Corridors and Ecological Networks) (see Figure 5) (Latimer; Hill 2008: n. pag.).

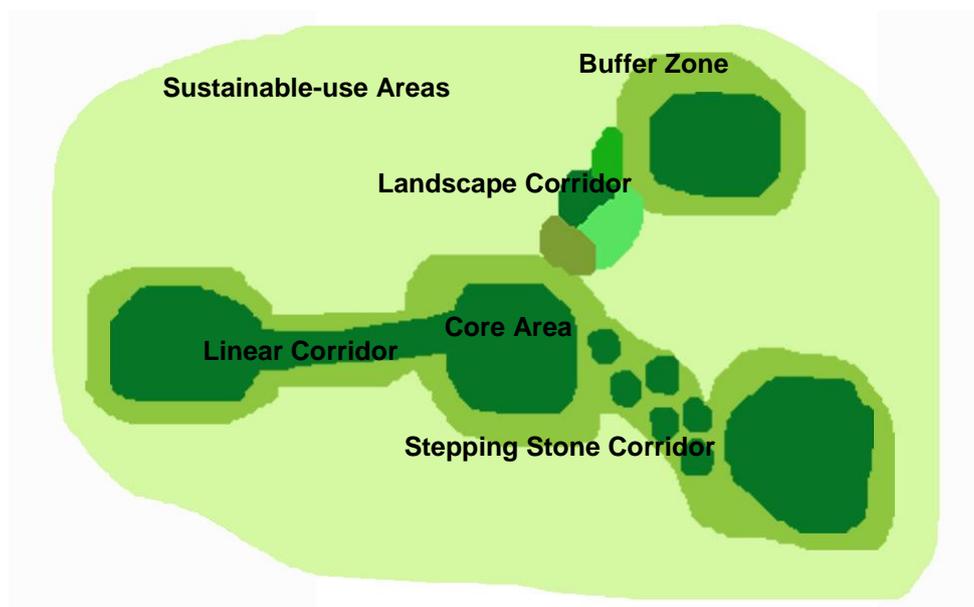


Figure 5: Ecological Networks and Green Corridors

Source: after Countdown 2010: Pan-European Ecological Networks. Available at: http://www.countdown2010.net/image_archive/econet.gif. Accessed: 18.10.2008.

“More recently the basic principle of landscape connectivity has been extended to a consideration of ecological networks as a wildlife conservation strategy. The network is defined as a framework of ecological components providing a range of core habitat areas, corridors and buffer zones in order to sustain the set of physical and biological systems necessary for ecosystems and species populations to survive in a human-dominated landscape [...] From this definition, it is clear that ecological networks are more than a mere latticework of linear connections, rather they should comprise broad landscape connections with mosaics of habitats present which may include linear features as well as spatially and ecologically diverse habitat patches” (Latimer; Hill 2008: n. pag.).

There are several examples of offset policies that are completely functionally and spatially disconnected from the impact. This is the case when **compensation payments** are issued, instead of tangible compensation measures. The Brazilian Environmental Licensing System for instance, requires a compensation payment, which is contributed to the management costs of the National System of Conservation Units (protected areas). Nevertheless, a general preference should be given to **natural compensation** and compensation payments have to be considered as the last resort.

A problem with the implementation of compensation measures is the time lag between the impact and the positive outcomes of the offset (e.g. newly planted trees may take decades to grow). Therefore the question of appropriate **timing** of offsets is an important issue: Should offsets be put in place prior to any development, and how can this be achieved (Bishop 2006: 10)? Even though it is preferable that biodiversity offsets are operational and proven prior to the occurrence of project impacts, this is difficult to achieve (Biodiversity Neutral Initiative 2005: 40). This anticipatory approach may be best addressed using **pool and banking models**. The former provides areas or measures, which are ready to be used. The latter are generally **economic arrangements** (banking, credit trading or trust funds), which technically and financially support the implementation of compensation measures. Nevertheless, both of these models must avoid weakening the application of the mitigation hierarchy, which may be a risk particularly for commercial pool models (Peters et al. 2001: 19). Furthermore, pools should not be used to substitute for the other conservation and restoration obligations of authorities or private institutions (Peters et al. 2001: 19).

The main difference arising from these approaches, regardless of temporal aspects, lies in a possible shift of responsibility for the implementation of biodiversity offsets. According to the “**polluter pays principle**”, generally the project proponent is liable for the damages caused by the project, and has therefore to put in place appropriate compensation measures. Nevertheless, the development and implementation of offsets can be carried out either on a **project-by-project** basis, i.e. by the project proponent providing actions and measures, or devolved to a **third party** (Escorcio Bezerra 2007: 11). The latter includes **mitigation banks** (e.g. US Wetland Mitigation Banking), **conservation banks**, **in-lieu fee arrangements**, **auction and brokering schemes**.

“Third party approaches could be sub-divided in banking frameworks and in-lieu arrangements. Banking frameworks are those schemes in which entrepreneurs, by developing their own offset initiatives can earn credits and then recapture their investment by selling these credits to project developers with offset obligations” (Escorcio Bezerra 2007: 11). This gives rise to several advantages:

- greater geographic scale of mitigation,
- greater flexibility for site location,
- opportunity to guard against temporal losses and risk of mitigation failure, and
- more cost-effective conservation (economies of scale, turning liabilities into assets, lower costs for project proponents and regulators) (Biodiversity Neutral Initiative 2005: 17f).

“In-lieu arrangements are those in which a project developer provides **funds** to an in-lieu sponsor instead of implementing its own project-specific offset or acquiring **credits** from banking” (Escorcio

Bezerra 2007: 12). This allows the sponsor (usually a state agency, land trust or conservation organisation) to collect funds from multiple project proponents and to establish targeted offsets (Biodiversity Neutral Initiative 2005: 20).

Another important issue, related to the responsibility of the project proponent to compensate for the unavoidable, mitigated residual adverse impacts, is the question of how far this responsibility is extended. As a general principle, offsets must be designed for **sustainability**, aiming at **long-term success** (Escorcio Bezerra 2007: 15; Bishop 2006: 10; BBOP 2007: 6). This includes

- the viability of key biodiversity components,
- the reliability and accountability of governance and financing, and
- social equity (BBOP n.d.: 5).

Therefore **monitoring and follow up programmes** and **performance reviews** should ideally be put in place to underpin the goal of ensuring **perpetuity**. “Offset policies note the need for legal and financial assurances to secure site tenure, restrict harmful activities, support long-term management and monitoring, and cover contingency and remedial actions in the event of offset failure. Where the success of an offset is less certain, or early credit release has been allowed, higher financial assurances may be required” (Biodiversity Neutral Initiative 2005: 43).

3 Benchmarks

Despite all the global efforts to mitigate impacts and to protect habitats and species, we have to acknowledge that there is an ongoing, drastic loss of natural and seminatural areas. Based on IUCN data and analysis, there are more than 16,000 endangered species. The relevant negative driving forces are well known and usually man made or at least intensified by man: population growth with the associated increased need for settlement and food production land; poverty; economic development and global climate change.

The loss of habitats and species is not a new issue, but formerly it was a discussion restricted to specialists, while only making a marginal impact as a political issue. With time this has changed, and the pressure on habitats and species in some developed countries led to the insight that compensation for these ongoing losses is crucial.

One of the compensation regulations of note is the **US Wetland Mitigation** (1985), based on the **Clean Water Act**. While this compensation approach is well established in the international literature (information is available on the internet in the English language!), little is widely known about an older, but more comprehensive compensation regulation, the **German Eingriffsregelung (impact mitigation regulation)** from 1976, based on the **Federal Nature Conservation Act** (Bundesnaturschutzgesetz BNatSchG).

German Eingriffsregelung (Impact Mitigation Regulation)

In Germany, the Federal Nature Conservation Act establishes the general framework for the Eingriffsregelung, while implementation is regulated through the nature conservation law of the federal states (Bundesländer) (Peters et al. 2002: 14). According to Article 19 BNatSchG, impacts on nature and landscape have to be avoided. These are defined as “changes to the shape and appearance or utilisation of land or changes to the groundwater table with its close correlations to inhabited soil compartments, that may significantly impair the ecosystem, or the natural scenery” (Durner 2001: 2). The 2002 update of the BNatSchG indicates the broad field of application of the Eingriffsregelung, which not only includes selected natural resources (e.g. particularly valuable animal and plant species or conservation areas), but the entire ecosystem (Naturhaushalt) and its capacity and natural scenery (Article 18 BNatSchGNeuregG, Peters et al. 2002: 14). This should broadly ensure the **status quo** of nature and landscape in perpetuity.

However, in the case of unavoidable impacts, the project developer has to implement appropriate measures of nature conservation and landscape management (Naturschutz und Landschaftspflege) to compensate (Durner 2001: 2). The Eingriffsregelung requires the application of a mitigation hierarchy, following different steps for the evaluation of impacts and the elaboration of counterbalancing measures (see Figure 6). These range from avoidance to mitigation and compensation and possibly a compensation payment (Peters et al. 2002: 14f). Thus, the Eingriffsregelung covers two focal points, one being the obligation to conserve the status quo via avoidance (preventive approach), and the other being compensation for unavoidable impacts (corrective approach).

As laid down in Article 18 of the Federal Nature Conservation Act, the application of the Eingriffsregelung begins with the identification and evaluation (in terms of significance) of the impacts of a project, plan or action on nature and the landscape. Due to the very broad meaning and scope of “ecosystem and landscape scenery” and a comprehensive spatial approach, most actions that are subject to authorisation are obliged to carry out an assessment based on that shown in Figure 6, regardless of the size of the action and whether a particularly valuable area is affected or not (Peters et al. 2002: 15).

According to Article 19 (1) of the Federal Nature Conservation Act the “intervening party shall be obligated to refrain from any avoidable impairment of nature and landscape“ (Federal Nature Conservation Act of March 2002: 39).

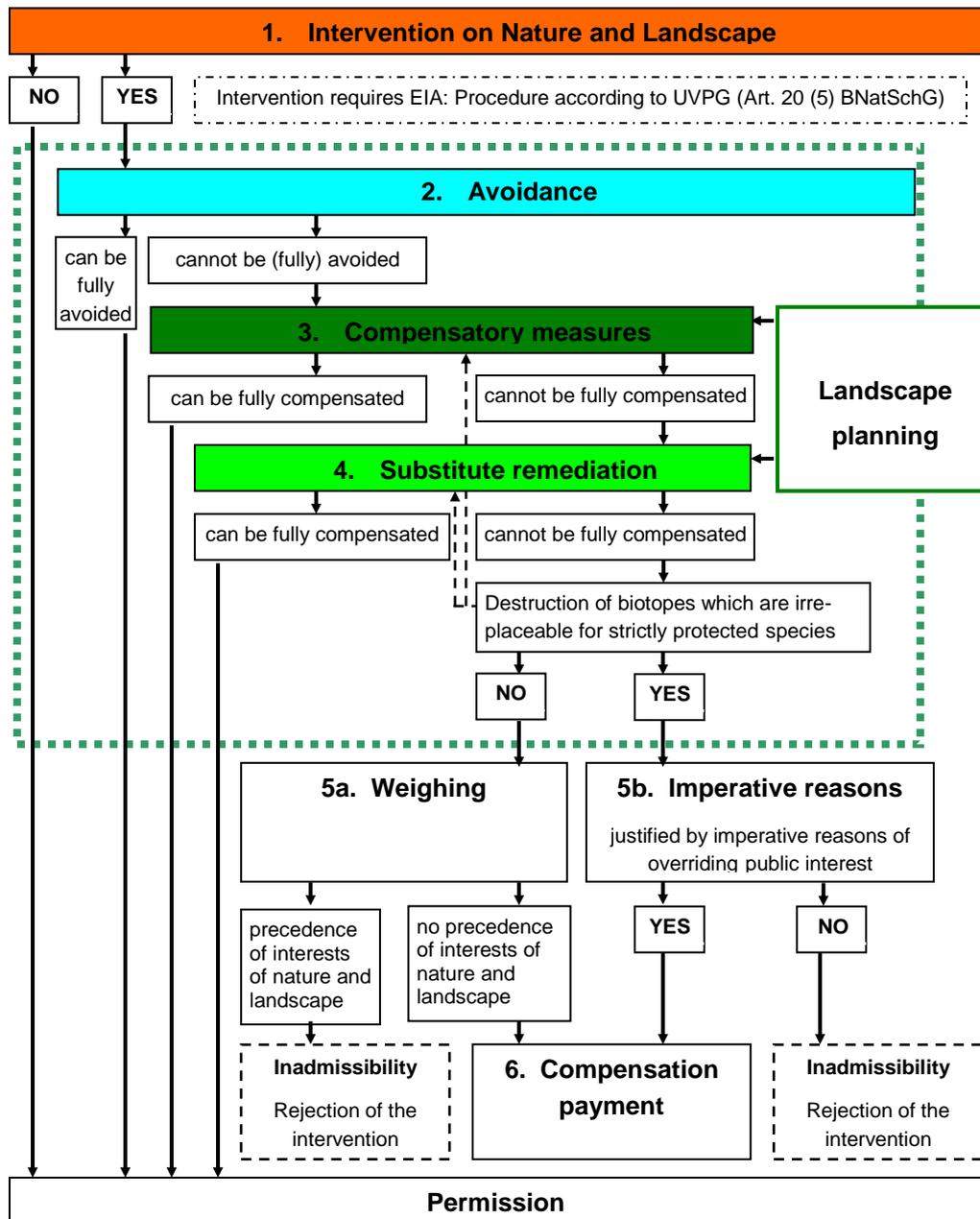


Figure 6: Steps of the German Eingriffsregelung

Source: after Bundesamt für Naturschutz 2007: 28.

The avoidance requirement protects not only the current state of the environment, but also takes into consideration future developments, as far as their occurrence can be predicted. In this respect, the Eingriffsregelung also secures nature and the landscape for the future (Bundesamt für Naturschutz 2007: 48).

As noted above, unavoidable impairment has to be compensated through nature conservation and landscape management measures (Peters et al. 2002: 16). The extent of the compensation measures under law is determined by the **principle of full compensation**. This principle stipulates that signifi-

cant or lasting impairment caused by an impact on nature and / or the landscape has to be compensated entirely by appropriate measures and, in the case of remaining adverse impacts, by a compensation payment (Bundesamt für Naturschutz 2001: 8; Federal Nature Conservation Act of March 2002: 40). The proposed measures have to ensure a sufficient and appropriate compensation, in accordance with the provisions in Article 19 (2) BNatSchG: “The intervening party shall be obligated to primarily endeavour to offset any unavoidable impairment through measures of nature conservation and landscape management (**compensatory measures**), or to offset them in some other way (**substitute remediation**). An impairment shall be considered to have been compensated for (Ausgleichsmaßnahmen, compensatory measures) as soon as the impaired functions of the ecosystem have been restored and the natural scenery has been restored or re-landscaped in a manner consistent with the landscape concerned. An impairment shall be considered to have been offset in some other way (Ersatzmaßnahmen, substitute remediation) as soon as the impaired functions of the ecosystem have been substituted in an equivalent manner or the natural scenery has been re-landscaped in a manner that is consistent with the landscape“ (Article 19 BNatSchG, Federal Nature Conservation Act of March 2002: 39). According to the Federal Administrative Court of Germany, compensatory measures (Ausgleichsmaßnahmen, in kind) refer to measures that aim to restore conditions in the affected natural landscape unit to the state prior to the impact, ensuring the same functions and without losing the main components of the visual composition of the landscape (Durner 2001: 2). By contrast, substitute remediation (Ersatzmaßnahmen, out of kind) refers to measures that do not necessarily have to restore the same functions and which might have only a loose spatial and functional relation to the impact area (Louis 2004: 3). Summing up, measures of similar type (in kind) are preferred over measures of similar value (out of kind).

Federal states may establish **pool or banking models** (Flächen- und Maßnahmenpool, Öko-Konto). These pools of areas or measures aim at the provision or concentration of measures (Peters et al. 2002: 16). A nationwide survey confirmed the broad application of pools of areas (Flächenpool), identifying several hundred pools, which are used both by public authorities and private project proponents (Böhme et al. 2005: 2).

US Wetland Mitigation

The **National Environmental Policy Act** (NEPA) is the main environmental law in the USA. It defines the concept of environment, covers different sectors and mediums and establishes the fundamentals of EIA and the obligation to avoid and correct environmental damages (Peters et al. 2002: 160). Additionally, the **Endangered Species Act** regulates the restoration of lost habitats, while prohibiting “in principle any land use which adversely affects an endangered species or its habitat”, regardless of whether this relates to private or public land (Sivantola n.d.: 7). Further nature conservation laws and regulations exist at national and state levels (Peters et al. 2002: 161).

After NEPA, the mitigation and compensation of wetlands according to the **Clean Water Act** (CWA) is the second most important approach to addressing impacts on biological diversity. CWA follows the goal of “**no net loss**” and thus, requires compensation for unavoidable impacts on wetlands (Peters et al. 2002: 161). In principle, according to section 404 activities in wetlands are forbidden, if thereby, the wetland would be significantly damaged or if a feasible, less environmentally harmful alternative exists. However, permissions can be granted under exceptional circumstances by the US Army Corps of Engineers (the most important authority for the execution of the law) (Peters et al. 2002: 170). In this case a compensation process is initiated, including procedures and measures to mitigate and compensate for impacts on wetlands and aquatic ecosystems, all of which are captured by the term ‘**Wetland Mitigation**’ (Peters et al. 2002: 169). In basic terms, the process includes a **three-step mitigation hierarchy** (see Figure 7). First, the project proponent has to **avoid** alteration of wetlands by using the least environmentally damaging site. This may include sites that are not owned by the

proponent. Second, a plan has to be developed to **minimise** the adverse effects of the unavoidable impacts. Finally, if after the **rectification** and **reduction** over time, impacts still remain, the proponent has to adopt appropriate **compensation** measures (Suvantola n.d.: 6; Peters et al. 2002: 173). These may include the following hierarchy of approaches:

- **Restoration** of wetlands,
- **Creation** of wetlands,
- **Enhancement** of wetlands, and
- **Preservation** of wetlands (see Figure 7) (Peters et al. 2002: 173).

As a final step, the proponent may choose between paying **monetary compensation** or using the services provided by a **mitigation bank** (Peters et al. 2002: 174). Generally, **Wetland Mitigation Banking** refers to the principle of bundling measures that are carried out by a third party, usually a private investor with a commercial interest (Peters et al. 2002: 169). However, mitigation banks can be classified according to their purpose and structure of ownership: **purpose-related banks** are used for the compensation of certain kinds of interference, usually by only one project carrier (Peters et al. 2002: 175). A further distinction can be made between **private** (e.g. compensation for several impacts of one project proponent) and **public** (e.g. road planning) projects or actions (Herberg 2005: 6). **Commercial banks** are usually operated by a private entrepreneur, who sells credits to different intervening parties (Peters et al. 2002: 175).

Monitoring plays an important role in the concept of Wetland Mitigation. In this context, the term refers both to the follow up of measures and the monitoring of the ecological and hydrological conditions in the area. Monitoring can therefore be viewed as the scientific observation of the development and the effectiveness of implemented measures (Peters et al. 2002: 174).

Comparison

The German Eingriffsregelung, based on the Federal Nature Conservation Act, covers all kinds of habitats. Compensation is strictly required for impacts from all kinds of land use that need a public permission. This requires a methodology to measure the ecosystem and landscape scenery across the whole area subject to impacts. In contrast, US Wetland Mitigation is restricted to wetlands and aquatic habitats, and therefore all methodological provisions are designed to measure the functions of these particular areas (Peters et al. 2002: 174).

In common, the US and German impact mitigation regulations are both based on the “polluter pays principle”. In the case of Wetland Mitigation the application of the mitigation hierarchy aims to promote on site and in kind offsets, i.e. closely functionally related to the state of the affected wetlands prior to the intervention and located in the vicinity of the impact area. Figure 7 compares the steps of the mitigation hierarchy of the German Eingriffsregelung and US Wetland Mitigation. In contrast to the US approach, in Germany preservation is not a compensation measure, because there is no additional benefit for nature, it merely safeguards the status quo. A compensation measure under German compensation law requires at least an enhancement of the recent status.

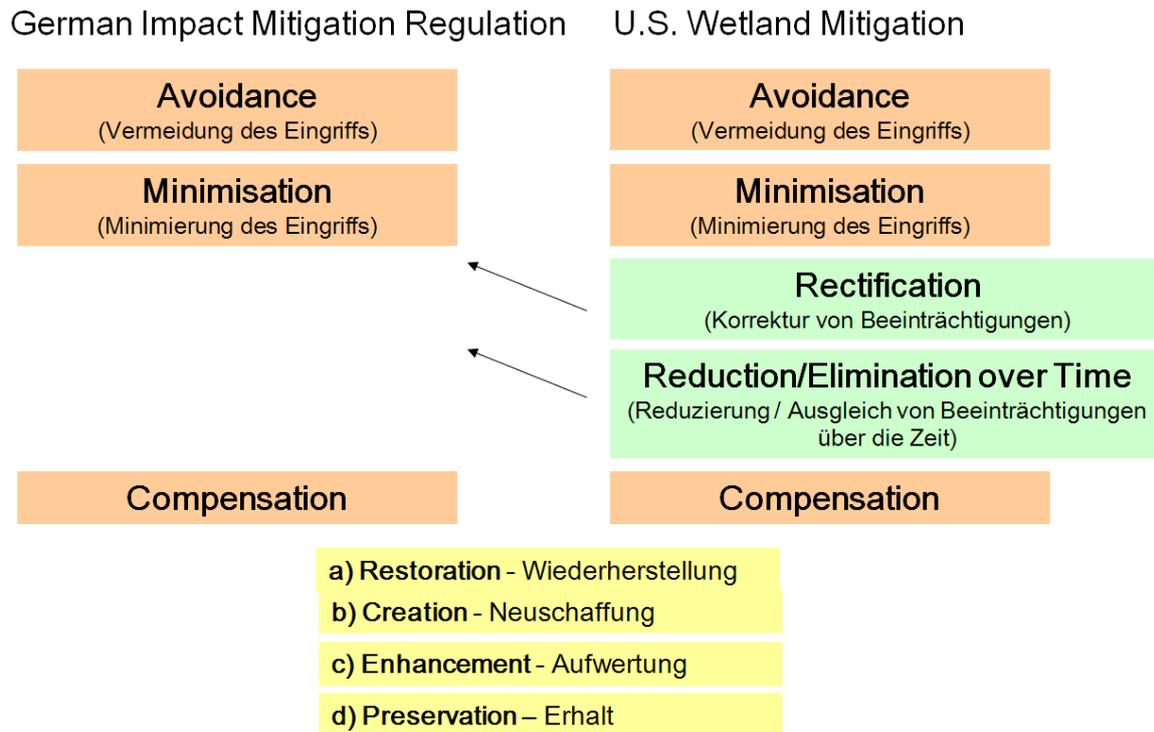


Figure 7: The mitigation hierarchy in the German Eingriffsregelung and the US Wetland Mitigation

Compared to the German Eingriffsregelung, the requirements for follow up and performance reviews are stronger under US Wetland Mitigation (Peters et al. 2002: 181).

The management of compensation measures in the context of Wetland Mitigation Banking must be considered a parallel activity to off site offsets. Parallels can be drawn to German pool models seeking the provision of compensation areas and measures. The regulations relating to the establishment and authorisation of banks and the fixed goal of in kind offsetting are remarkably strict, and partly exceed the provisions of existing or proposed models in Germany (Peters et al. 2002: 181).

4 Methods

To handle the broad task of the study the research was broken down into three consecutive methodological steps (see Figure 8):

- Pre-investigation (Step 1),
- Main-investigation (Step 2) and
- Case studies (Step 3).

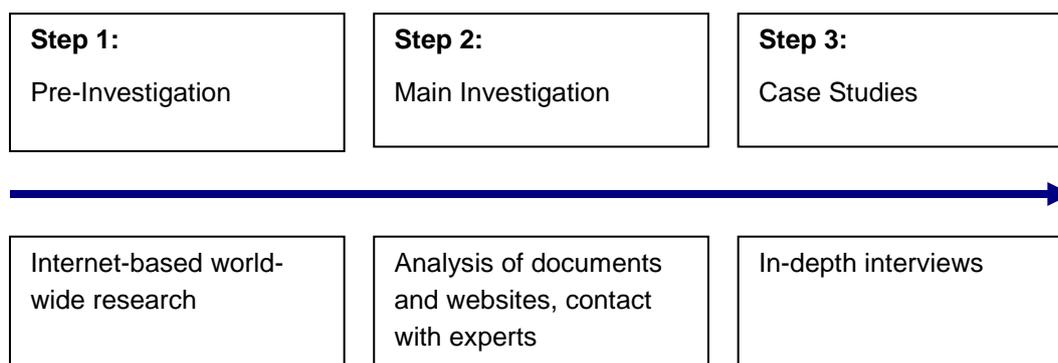


Figure 8: Methodological steps

Pre-investigation

The pre-investigation took an orientation approach. Four thematic areas related to compensation for impacts on natural systems and processes (and their respective key documents) were considered:

- Biological Diversity and the CBD,
- The German Eingriffsregelung as defined in the German Federal Nature Conservation Act (BNatSchG),
- Appropriate assessment according to the European Habitats Directive and
- Environmental Impact Assessment and the EIA Directive.

On the basis of these four themes and the research questions noted in Chapter 1, an analytical framework was developed, containing terms and phrases that described the field of research. Starting from this very broad framework, key terms were extracted and combined to generate search inquiries, which were then entered into Google™. The choice of keywords and their combination was based on experiences during pre-tests of this approach. Therefore the quality and quantity of hits were used as criteria, leading to the selection of seven search inquiries:

- 1-4 = different terms related to compensation (compensation, restoration, remediation, mitigation) in combination with the aforementioned four thematic areas (CBD, impact mitigation regulation, Habitats Directive, EIA).
- 5 = combination of “impact” and biodiversity-related terms.
- 6 = focus on compensation measures in combination with “environment”.
- 7 = access and benefits sharing (according to the CBD).

As a subsequent step, these search inquiries were translated into a range of languages covering a broad spread of countries and regions of interest to the study: German, French, Spanish, Portuguese, Russian, Swedish, Chinese and Korean.

Based on these theoretical fundamentals (the analytical framework and search inquiries) the pre-investigation was undertaken in two stages using the Google™ web search interface:

- During the **quantitative research** stage only the English search inquiries were used to scan the country domains (e.g. .uk for United Kingdom). As a first step, the absolute number of hits (without consideration of their quality) was recorded and displayed in tabular and graphical formats to give a comparative worldwide assessment as to which countries might be suitable targets for further research. (Again it is emphasised that this cannot cover all existing approaches, nor can any conclusion be drawn regarding the degree of sophistication or the scope or number of possible compensation approaches.)
- Giving that English is recognised as the main scientific language in only some countries, in the **qualitative research** stage, in addition to English, a number of other languages were used in the Google™ investigation to ensure the maximisation of hits. Appropriate languages were selected for Latin America (Spanish, Portuguese), Francophone Africa (French), Asia (Chinese, Korean, and Russian) and Europe (e.g. Swedish). Results from the English and other language search inquiries were qualitatively analysed with regard to their content and the relevance to the topic in question. A large number of web sites and documents were reviewed and relevant web pages and documents were downloaded and recorded in a database.

Main investigation and case studies

The results of the pre-investigation generated a list of possible target countries for further detailed research. Ten countries were chosen for examination during the main investigation (Step 2) and case studies (Step 3): Australia, Argentina, Brazil, China, Egypt, India, Madagascar, Mexico, South Africa and South Korea. Detailed research was undertaken for five countries:

- Argentina,
- Brazil,
- Egypt,
- Madagascar and
- Mexico.

Due to budgetary limitations, a less detailed assessment of the situation in China and South Korea was carried out, while research on Australia, India and South Africa was completed at a more general level.

As part of the main research, the downloaded documents and web pages were explored in detail and the extracted information was analysed in the context of the research issues (see Chapter 1). Based on terminology used in the documents and web pages, additional search inquiries were generated where appropriate and entered into Google™.

Parallel to the main investigation, projects and potential contacts (experts, practitioners, members of the administration etc.) were identified in each of the countries. The identified compensation approaches were examined within the scope of the case studies, with ongoing integration of new or more detailed information as it became available. Practical aspects of the compensation approaches were addressed through the analysis of actual projects and by verbal and email exchanges with experts.

It is important to emphasise that each of the ten examined countries **exhibits a different depth of information** (due to the country-specific environmental, social, political and economic context and the different degree of development and sophistication of the compensation approaches in each country).

Therefore it is not always possible to draw comparative conclusions with respect to international and German impact mitigation regulation (Eingriffsregelung).

5 Survey of Impact Mitigation Regulation

As mentioned above, the pre-investigation worldwide search results were analysed quantitatively and qualitatively. The absolute numbers of hits per country domain were displayed in a table, as a bar chart and in a map, using three categories:

- Green: more than 500 hits.
- Orange: between 101 and 500 hits.
- Grey: up to 100 hits.

Furthermore, the downloaded documents were reviewed qualitatively with respect to existing or proposed compensation approaches. On this basis countries were classified into three categories and represented in a map (see Figure 9):

- Green: compensation approaches in place or of particular interest and less well known.
- Orange: potential compensation approaches (under development or discussion).
- Grey: no compensation approaches identified.

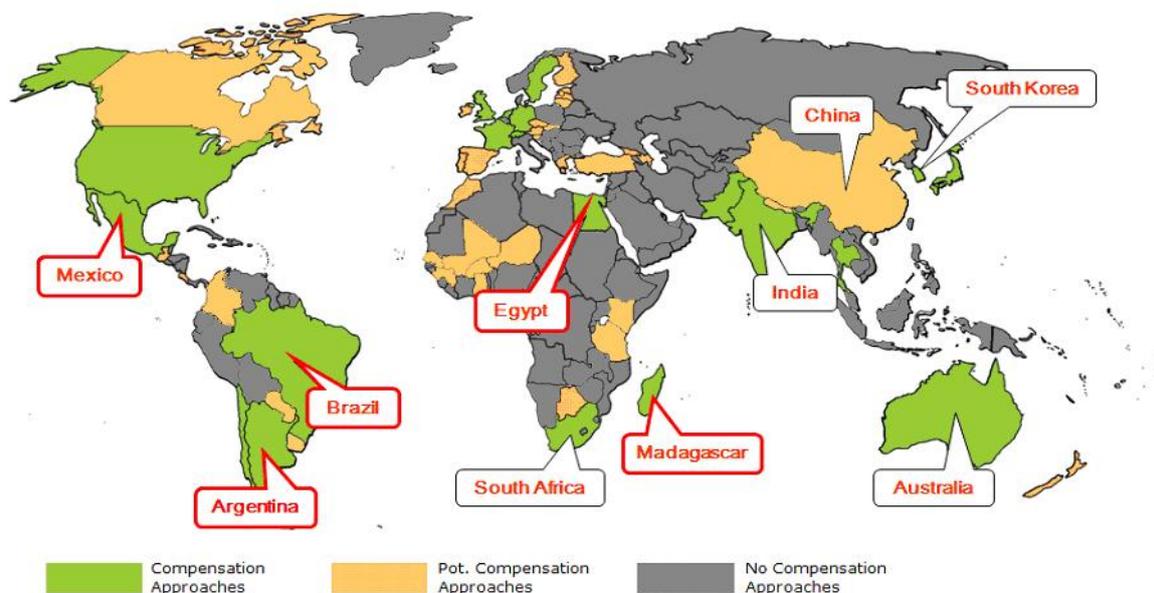


Figure 9: Results of the pre-investigation (Step 1): compensation approaches worldwide

The qualitative results of this first step show that compensation approaches exist in numerous countries. In several other countries there seem to be similar approaches, which need to be verified through further studies (see Figure 9). EIAs are undertaken in many countries for major projects in different sectors, e.g. oil and gas, mining, energy, pipelines, road planning, traffic and hydropower. This approach usually includes mitigation principles. The “polluter pays principle” is widely recognised and liability for damages is stipulated under laws relating to the environment, mining, forests, waste and water. In some countries compensation payments are required, e.g. in the Brazilian project developers’ offset.

Table 1: Compensation approaches in selected countries

Compensation approaches in selected countries	
Argentina:	EIA, Environmental Compensation Fund
Australia:	Native Vegetation Offset Programs in Victoria, New South Wales and Western Australia, NSW Wetland Management Policy, Biodiversity Banking and Offsets Scheme in NSW, BushTender Program and BushBroker System in Victoria
Brazil:	Forest set-aside offset, project developers' offset and National System of Conservation Units, Environmental Compensation Fund, Proambiente Program
China:	Eco-compensation (in discussion), pilot projects (road planning, land consolidation, hydro-power)
Egypt:	EIA / Environmental and Social Impact Assessment (ESIA), sectoral guidelines for major projects
India:	Biological Diversity Rules, mitigation schemes and wetland mitigation schemes (under development)
Madagascar:	Sectoral EIA guidelines for major projects, MEC for existing facilities, biodiversity offsets for mining projects, FOREAIM Project (Bridging restoration and multi-functionality in degraded forest landscape of Eastern Africa and Indian Ocean Islands), Eco-Certification
Mexico:	EIA, Administration Programme of Environmental Justice
South Africa:	EIA, Provincial Guidelines for Biodiversity Offsets (Western Cape Province)
South Korea:	Substitute habitats (dam-construction projects), eco-bridges, research / discussion about adaptation and implementation of the German impact mitigation regulation (Eingriffsregelung) (using Incheon City as pilot project)

The results of the pre-investigation are summarised quantitatively and qualitatively for each continent below.

Africa

Based on a worldwide comparison, the absolute number of search hits for the African continent lies below the average. Furthermore, the hits are dispersed in a very heterogeneous pattern, possibly reflecting the limited establishment of the Internet as a platform for communication in several African countries, e.g. Somalia possesses only three web pages in total. Additionally, many countries are facing political and social situations that take priority over other issues. When comparing the search hits for the four thematic areas (see Chapter 4), the majority of results refer to EIA, with a smaller number of hits for impact mitigation and the CBD (these hits typically refer to poverty reduction and other socioeconomic issues). Very few hits for the Habitats Directive were recorded.

Due to the lack of legal and / or institutional basics and their implementation (research institutes, authorities, NGOs) compensation approaches appear to be completely non-existent in several countries. According to the CBD, Access and Benefit Sharing are of special importance for local populations, as these are dependent on the exploitation of natural resources as a priority source of livelihoods. The EIA is applied as well for certain projects and in some countries for plans and programmes. Additionally, (sectoral and general) guidelines are provided in some countries. Several other instruments exist alongside EIA: Environmental and Social Impact Assessments (ESIAs), Environmental and Social Impact Mitigation Plans, National Sustainability Strategies and Action Plans, Environment Action Plans etc. Legal provisions were noted for the environment in general or in specific relation to EIA, water, forests and mining. The latter seems of particular (and international) importance, as there are several African countries with huge and diverse mineral resources. The respective mining laws contain provisions requiring the restoration of the environment to its pre-impact state.

South Africa is in an advanced position both quantitatively regarding the number of search hits, and qualitatively. The 1998 EIA regulation, which extends to social and economic imperatives, addresses such issues as monetary compensation, replacement of wetlands and relocation of villages. Guidelines for biodiversity issues are part of the EIA. In the Western Cape province, the Department of Environmental Affairs and Development Planning has developed guidelines for biodiversity specialist studies conducted as part of the EIA and has set up a "Provincial Guideline on Biodiversity Offsets" in 2007. In **Botswana** the EIA focuses on the reduction or rehabilitation of adverse impacts. Mitigation plans are planned and biodiversity damage compensation will be developed. In **Madagascar** general and specific mitigation and compensation measures are defined in the EIA guidelines. Furthermore, biodiversity offsets following a net gain approach are being piloted in the mining sector. In **Egypt** and several other countries like **Morocco** and **Senegal** the focus is the EIA system. The Egyptian Environmental Affairs Agency issues guidelines for different sectors or project activities, e.g. oil and gas sector, land reclamation projects etc. In 1997 the Ministry of Equipment, Infrastructure and Transportation of **Niger** launched an initiative to conduct EIAs for road planning projects. Since then mitigation and compensation (including the mitigation hierarchy) have been under discussion. For example, the planting of new trees to replace those cut down is proposed as a compensation measure.

Asia

Surprisingly for Asia, the pre-investigation identified several countries for which there were many search hits. Among these were the large, populous countries such as Russia, China and India, but also smaller and less populous nations such as South Korea, Japan and others. Essentially the high hit rate relates to EIA, representing more than 50% of the absolute number of hits in South Korea and Thailand and around 90% in India, Japan and China. Based on results recorded for the Habitats Directive and Natura 2000, these do not appear relevant in the context of Asia (as was the case in Africa).

In Southeast Asia there are an increasing number of academic publications discussing the 'importation' of US Wetland Mitigation and also the German Eingriffsregelung. There are associated indications of pilot projects for these two approaches. In Russia and the Caucasus region results related to EIA dominated, in particular EIA associated with tangible projects. Often ESIA's are encountered, whereas compensation issues are seldom considered and barely legally defined.

In **China**, since 2002 the Environmental Impact Assessment Law has required measures and countermeasures to prevent and to mitigate impacts. The EIA is the most important tool for the implementation of the CBD with regard to a "Policy of who damages restores, who utilizes will compensate the environment" (Ministry of Environmental Protection of the People's Republic of China n.d.: n. pag.). There are numerous articles relating to "eco-environment compensation" or "eco-compensation", while there are also mentions of pilot projects for road planning, reallocation of land and hydropower. In **Japan** compensation entered into force as part of the Environmental Impact Assessment Law in 1999. However, practical implementation has started more recently. The Shiki city compensatory mitigation ordinance is a pilot project in this field. Additionally, the introduction of the German Eingriffsregelung is under discussion. In 2006 an academic discussion started in **South Korea**, aiming to establish a Wetland Mitigation Banking approach with a "no net loss principle". This has not yet been implemented. More recently, South Korean politicians have attempted to initiate compensation measures. In parallel, there has been research on defining which of several international compensation approaches would be the 'best fit' in the South Korean context. One recommendation was to adapt the German Eingriffsregelung. In 2008, following the election of a new president, the research seems to have been stopped due to the rise of other political priorities. In **Pakistan**, compensatory measures are mentioned in the EIA process (which is provided for under the Environmental Protection Act of 1997). Following the Pakistan Environmental Protection Agency Regulation of 2000 an "Environmental Management Plan" is required which includes mitigation measures. Likewise, in **Thailand** "measures to

prevent, correct the impacts and to compensate the damage” (EIA Development Group, Environmental Impact Evaluation Bureau and Office of Natural Resources and Environment Policy and Planning n. d.: n. pag.) have to be included in a Mitigation Plan as a part of the EIA-Report. In **India**, since 2004 projects causing impacts that cannot be controlled or mitigated can be rejected, according to the Biodiversity Rule. In 2005 guidelines for involving biodiversity specialists in EIA were developed and in 2007 a document entitled “Best practice guidance for biodiversity–inclusive impact assessment: A manual for practitioners and reviewers in South Asia” was published.

Australia and Oceania

Australia and New Zealand, the largest and most populous countries, take a leading position. Search hits related to the CBD and EIA account for approximately 90% of the total. The remaining 10% are associated with impact mitigation regulation, while the Habitats Directive is largely irrelevant.

The particularity is that market-based approaches are of priority importance. Besides, in relation to the EIA socioeconomic interests are considered.

In **Australia** a distinction can be made between Federal and State levels. At Federal level the Environmental Protection and Biodiversity Act establishes the framework and stipulates a net benefit approach. However, it is at state level that various compensation approaches are being developed and implemented. As previously mentioned, market-based instruments dominate, e.g. the Biodiversity Banking and Offsets Scheme in New South Wales, Biodiversity Trading in South Australia and the Bush Tender / Bush Broker Program in Victoria¹. In New Zealand the EIA Act stipulates only avoidance, remediation and mitigation (no compensation). Notwithstanding this omission, regional-scale district plans may stipulate the conditions under which certain environmental resources may be used. Under these stipulations there are examples of compensation measures being applied.

Europe

In most European countries the proportion of hits relating to EIA exceeds 50% of the total, with the CBD and Habitats Directive representing around 20% each. Impact mitigation accounts for the remaining 10%. Not surprisingly, the majority of hits was associated with activities in the United Kingdom, reflecting the fact that the search inquiries were primarily formulated in English. Many countries show between 1000 and 3000 search results, including Germany, where a bias is noticeable because of the tendency to publish in the national language. Given the relatively recent instruments, politics and research in east European countries, search hits for these were below average. In several countries there are known existing compensation approaches (e.g. Germany, Switzerland). Additionally, according to the European Habitats Directive, all member countries of the European Union have to put in place measures for a coherent Natura 2000 network. The Habitats Directive includes appropriate assessment and compensation. Approaches similar to the German Eingriffsregelung exist. The most developed are compensation approaches in the context of road planning. Compared with other countries worldwide, socioeconomic considerations play a minor role in Europe.

In **France**, compensation approaches have been identified (see Peters et al. 2002). Recently the French Prime Minister launched the “Grenelle Environnement”, a series of discussions, including one

¹ The Bush Tender Program has been established in 2002 to protect valuable native vegetation on private properties, by offering nature conservation services through a bidding process.

thematic area addressing the protection of biodiversity and natural resources in the context of planning and compensation. Likewise, compensation approaches exist in the **United Kingdom** (see Peters et al. 2001; Peters et al. 2002). Planning obligations exist at a regional level, and projects having adverse impacts may be rejected. Compensation pools are under discussion. In **Austria** a multitude of different impact mitigation regulations exist within the framework of the nature conservation law of the federal states. These regulations show similarities to the German Eingriffsregelung (see Peters et al. 2001; Peters et al. 2002). **Switzerland** has a compensation approach similar to the German Eingriffsregelung. However, in **Sweden** aspirations to introduce the Eingriffsregelung at national level failed. Nevertheless, compensation measures have been recently implemented for road planning EIAs. Furthermore, various cities and municipalities have established compensation requirements. In **Finland** a project to implement compensation measures in road planning is currently being piloted.

North- and Central America and the Caribbean

Compared to other countries worldwide, an enormous number of search hits was identified for the North American continent. The hits were distributed very unequally, with (not surprisingly) the USA and Canada responsible for the majority of hits and the many small and island states responsible for lesser numbers. While countries such as Mexico and Costa Rica generated a considerable number of hits, a bias was observed due to the relatively limited number of publications and webpages in English. As expected, research in Spanish significantly increased the acquisition of relevant hits in Spanish-speaking countries. Documents and websites related to EIA are found widely, while impact mitigation drew a large number of hits in Canada, Mexico and the USA (in the case of the latter, more hits for impact mitigation were noted than for EIA). For the Habitats Directive hits were only noted for Canada and the USA, and these were limited in number. Several hits were noted for the CBD, particularly in Canada. These hits generally related to National Biodiversity Strategies, Reports and Action Plans. In Central America comparable projects and guidelines exist for EIA.

As previously noted in Chapter 3, the **USA** has long established and well-known compensation practices, particularly Wetland Mitigation as provided for under the Clean Water Act. Parallels can be drawn with the German Eingriffsregelung, in as much as both include the application of the mitigation hierarchy (avoidance, minimisation, compensation) and subscribe to the “no net loss principle”. However, Wetland Mitigation is – as the name implies – limited to wetlands. In the context of US Wetland Mitigation, compensation comprises restoration, enhancement, creation or conservation of wetlands. Additionally, Wetland Mitigation Banking and Conservation Banking are commonly used. In **Canada** mitigation and compensation are mostly related to the impairment of habitats. In the law on fisheries the management of fish habitats is already implemented, following the “no net loss principle”. Nevertheless, the comprehensive legal regulations (including avoidance, minimisation and compensation) have not yet been properly implemented. In **Guatemala** and **Costa Rica** compensation approaches related to the CBD were identified. Guatemala has a national policy for the protection of wetlands and several projects related to implementation of the CBD. Costa Rica is more advanced and has a Biodiversity Law and a well-developed system of payments for environmental services (primarily water related) through contracts between the producers and the state. Similarly, in **Panama** a National Strategy for Payments for Environmental Services (2005) is in place. In this context, environmental services are related to biodiversity conservation and the reduction and avoidance of adverse impacts on ecosystems. The government defines a minimum of environmental services which have to be provided by the responsible either themselves or via a contracting party. Furthermore, private agreements exist, e.g. between hydropower businesses and landowners, the former paying the latter to implement compensation measures such as conservation of forest cover. In contrast to other Latin American countries, **Mexico** has well developed environmental politics. Instruments for avoidance, minimisation and compensation are modelled on the US example. On-site measures (rehabilitation) and off-site

measures (measures of equal value) are distinguished under Mexican EIAs. At the national level, the Administration Programme for Environmental Justice identifies the most important regions, which are those affected by adverse impacts arising from the activities of different sectors, and requires restoration, rehabilitation and / or compensation as appropriate.

South America

The hits for South America lie below the worldwide average, which primarily reflects the fact that English is not established as a language for academic publications. Thus, greater hits were noted when searching in Spanish and Portuguese. According to the thematic areas, it is apparent that the focus in South America falls on EIA as is the case in most parts of the world. Hits related to the CBD are noticeable lower, but still significant. In South America the European Habitats Directive and Natura 2000 seem irrelevant. Hits for impact mitigation were noted for several countries, e.g. Brazil, Chile, Argentina, Peru and Uruguay. When comparing the countries on the South American continent it is evident that Brazil, Argentina and Chile are the principal sources of hits, while Bolivia, Colombia, Ecuador and Venezuela are underrepresented. Altogether, mainly EIA processes are used in South American countries. In this respect, the legal basis and guidelines exist, but they are lacking proper implementation in tangible projects.

An exception that stands out is **Brazil**, where a number of different practical approaches or projects related to biodiversity compensation exist. Brazil is a vast and megadiverse federally organised country. The development of legislation takes place at a national level, but implementation is the responsibility of the states. A sophisticated environmental licensing system is in place, which is complemented by sectoral EIA guidelines in the states. According to the environmental licensing, the Protected Areas Law obliges enterprises to direct compensation payments to the National Protected Areas System, in order to compensate for their adverse impacts. For example, Petrobras (Brazil's most important oil producer) finances a biodiversity conservation project. NGOs like Tamar or Mata Atlantica are often involved in implementing these types of project. Furthermore, the Brazilian Forestry Code stipulates that rural landowners have to maintain a fixed minimum percentage of natural vegetative cover (ranging from 20% to 80% in the Amazon). In **Argentina** and **Chile**, biodiversity and EIA play an important role. In Argentina compensation and the creation of an environmental compensation fund are considered. In Chile, the provisions related to EIA explicitly require measures to avoid, minimise, repair and compensate, as well as preventive measures. Projects assessing the mitigation of impacts in protected areas also exist.

6 Selected aspects of impact mitigation regulation in different countries

6.1 Selected aspects of impact mitigation regulation in Argentina

6.1.1 Scope and objectives

When considering environmental damage and compensation issues in Argentina in the context of Argentinean environmental politics, it is important to first be aware of the federally organised political and administrative structure of the country. The federal system in Argentina entails a division of attributions of power and competencies between the national authorities and 23 provincial authorities who have competences over their natural resources (CBD 2007: 86; Koolen 1996: 48).



Figure 10: Federal Organisation of Argentina

Source: VisitingArgentina.com. Available at: <http://www.visitingargentina.com/mapas/argentine-map.htm>, Accessed: 20.10.2008.

The Federal Constitution emphasises the duty of each resident to conserve the environment for future use and requires the redress of environmental harm, aiming to restore the environment to its prior state (The American Chamber of Commerce in Argentina 2007: 10, 34). The superordinate goal of environmental policy is to improve the quality of the environment, **avoiding** degradation and promoting the **recovery** of affected natural resources (Congreso Regional de Ciencia y Tecnología 2002: 3). In keeping with this, the Forestry Resources Act identifies and defines “protected forests” as areas exempt from commercial exploration in order to preserve surrounding ecosystems and biodiversity (The American Chamber of Commerce in Argentina 2007: 34). The Act obliges landowners to register on the Protected Forests Registry and seek approval prior to altering these areas. Protected and permanent forests may only be altered if “improved” ecologically (The American Chamber of Commerce in Argentina 2007: 34).

Argentina is a signatory to the CBD (The American Chamber of Commerce in Argentina 2007: 36). Its National Biodiversity Strategy is divided into seven sections, one of which (section 4) relates to restoration and the prevention of environmental damage and is which is defined by the following objectives:

- To evaluate and monitor the status of degradation, using an eco-regional and river basin approach,
- To develop actions for recovering degraded ecosystems, and generating and promoting the application of appropriate technologies for each eco-region,
- To promote the integrated management of river basins and eco-regions and
- To **reverse or to compensate** the negative impacts of oil and gas, mining, hydroelectric etc. activities that affect biological diversity (Probio 2004: 26).

In section 5, the National Biodiversity Strategy focuses on the increase of national capacity with respect to biological diversity, aiming to strengthen Environmental Impact Assessment and environmental auditing (Probio 2004: 28). The obligation and procedure for undertaking an EIA is fixed under Law no. 25,675, the **Environmental Framework Law** (Ley General del Ambiente, LGA) which entered into force in 2002 (CBD 2007: 48). The LGA provides the framework for environmental management in Argentina and defines the provisions for Environmental Impact Assessment, and minimum environmental protection standards for adequate and sustainable environmental management, the preservation and protection of biological diversity and the implementation of sustainable development (The American Chamber of Commerce in Argentina 2007: 13). In Articles 11, 12 and 13, the LGA establishes that “any work or activity which, in the Argentine territory, is likely to significantly deface the environment, any component thereof or affect the people’s quality of life, is subject to an Environmental Impact Assessment proceeding, prior to its execution” (The American Chamber of Commerce in Argentina 2007: 14). The **Federal Council for the Environment** (Consejo Federal de Medio Ambiente, COFEMA) established EIA as a theme requiring priority action alongside wastes and effluents and the Federal Environmental Compensation Fund (see Chapter 6.1.7) (COFEMA 2006: 3).

Legislation for the execution of EIAs for projects with potential adverse effects on biodiversity has been established, but does not yet extend to the level of plans, programmes or policies (SEA) (CBD 2007: 48). In National Parks, regulation requiring an EIA for all projects is in force (CBD 2007: 25). Furthermore, various sectoral regulations (hydrocarbons, mining etc.) and regulations at provincial level exist (CBD 2007: 48). EIA procedures in Argentina are implemented at the provincial and municipal levels or are applied on a sector-by-sector basis (The American Chamber of Commerce in Argentina 2007: 38). The Province of Buenos Aires, for instance, enacted Law no. 11,723, the Provincial Law on the Environment (Ley del Medio Ambiente de la Provincia de Buenos Aires) which requires the provincial executive branch to assure the completion of an EIA for projects that may adversely affect the environment (The American Chamber of Commerce in Argentina 2007: 36). At the municipal level the Constitution of the City of Buenos Aires states in Art. 27 the need to “preserve and restore ecosys-

tems and natural resources, maintain and expand green spaces, and protect biodiversity” (The American Chamber of Commerce in Argentina 2007: 37).

Additionally, there are alternative instruments to enforce biodiversity concerns such as deterrents and economic instruments (Congreso Regional de Ciencia y Tecnología 2002: 3). Synergies between biological diversity and climate change are also used for mitigation via forestry projects (CBD 2007: 13). A project in the province of Santiago del Estero for example, builds on forestation with native species in degraded areas in ten of the province’s municipalities (CBD 2007: 13). Furthermore (international) certification is increasingly becoming a driver for businesses, as global companies apply corporate policies that include **ISO 14001 certification** and **Eco-Management and Audit Scheme (EMAS)** (Congreso Regional de Ciencia y Tecnología 2002: 6). Some companies respond to the demands of regulatory frameworks and a smaller number have voluntarily established the responsible use and care of the environment as a core principle (Congreso Regional de Ciencia y Tecnología 2002: 6).

6.1.2 Components of biodiversity and natural resources covered / measured

As Argentina is a signatory to the CBD, the relevant determinations of the components of biological diversity are reported in scientific papers, e.g. a publication concerning the handling of biodiversity issues in the oil and gas industry (Palmada 2005: 1). This publication recognises that the concept of biodiversity not only refers to ecosystems and their living components, but also to the ecological and evolutionary processes that keep them in operation and the valuable services that they provide (Palmada 2005: 1).

With respect to the forestry sector, the group representing Greenpeace in Argentina launched a biodiversity campaign in July 2006 with the aim of introducing a regulation to control land use in native forests (Ordenamiento Territorial de Bosques Nativos) (FARN Greenpeace de Bosques Nativos 2006: 30). Alongside the proposed regulation, ecological criteria have been proposed to evaluate the value of the environment or the forest units (FARN Greenpeace de Bosques Nativos 2006: 31f):

- Surface area (the plant and animal communities require a minimum size of habitat available to ensure their own survival),
- Overlap with other altitude levels (this is particularly important for birds who have their habitat across a range of altitudes),
- Overlap with existing protected areas and regional integration with such,
- Existence of outstanding biological values,
- Connectivity between eco-regions (ecological corridors),
- State of conservation,
- Forest capability,
- Capacity for agricultural sustainability,
- Watershed conservation and
- Presence of aboriginal communities or rural populations.

Furthermore, the national and sectoral legislation on EIA contains explicit provisions on biological diversity and its components e.g. fauna and flora (CBD 2007: 51). As an example, in the Province of Buenos Aires the **Industrial Zoning and Environmental Classification Law** requires EIAs for industrial facilities constructed or modified and notes the inclusion of the following components in the

evaluation: climate and geology, geomorphology, surface and underground water resources (and their current and potential use), atmospheric variables, and biological conditions (flora and fauna) (The American Chamber of Commerce in Argentina 2007: 39). In the same way the **General Environmental Guide for Investment Projects** (Guía Ambiental General para Proyectos de Inversión) which was launched by the Secretary of Natural Resources and Sustainable Development (Secretaría de Recursos Naturales y Desarrollo Sostenible) also notes that the analysis of the affected environment can be undertaken via the above-mentioned components. Additionally it stipulates that current environmental deficiencies and conflicts, and cultural and natural heritage areas such as national parks and archaeological sites and the human environment (e.g. population, cultural values etc.) should be evaluated (Secretaría de Recursos Naturales y Ambiente Humano 1995: p. 6f).

COFEMA judges that it is necessary to combine the evaluation criteria and also to unify the administrative procedures under different environmental authorities and establish a federal system of inter-court coordination (COFEMA 2006: 4).

6.1.3 Methods for the valuation and quantification of potential impacts

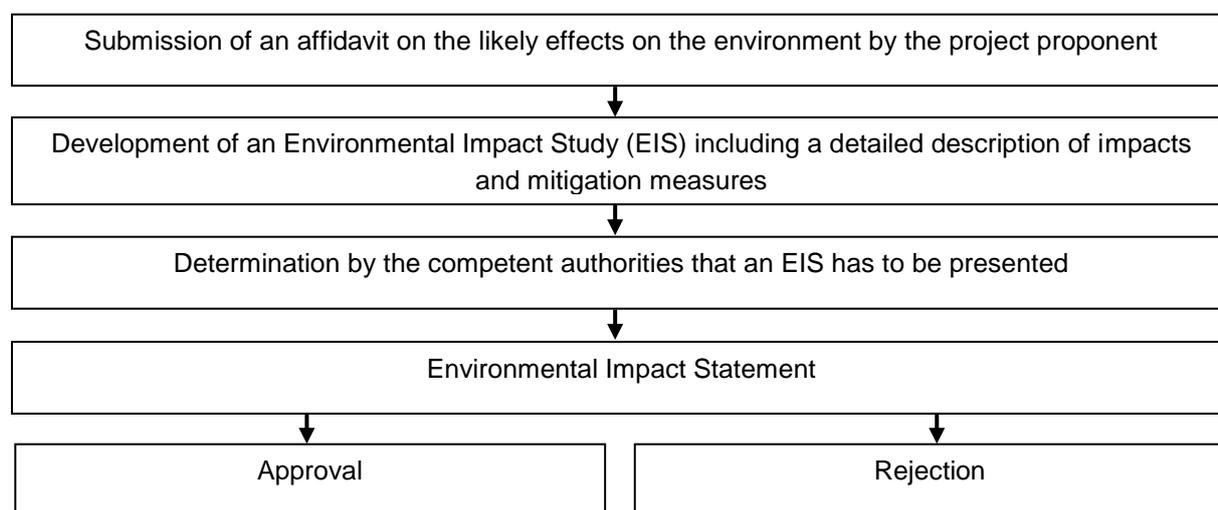


Figure 11: Procedure for an EIA according to the Environmental Framework Law (LGA)

Source: after COFEMA 2006: 4

The LGA regulates the procedure for EIAs via Articles 12 and 13 (COFEMA 2006: 4) (see Figure 11).

The General Environmental Guide for Investment Projects details the procedure for impact evaluation and the relevant methods (Secretaría de Recursos Naturales y Ambiente Humano 1995: 8f). Qualitative and quantitative methods are applied depending on the relative feasibility of each. Quantitative methods, used to measure environmental impacts in numerical or monetary terms, employ variables such as loss of vegetative cover in square meters (Secretaría de Recursos Naturales y Ambiente Humano 1995: 3). Furthermore, norms and parameters such as environmental standards that can be used as permanent thresholds for the evaluation of impacts on environmental quality, have to be identified and assigned (Secretaría de Recursos Naturales y Ambiente Humano 1995: 8). Other recommended methods are:

- Pressure-State-Response Models of the environmental resources or subsystems,
- Identification of areas critical to the occurrence, accumulation and dispersion of effects and

- Use of matrices (Secretaria de Recursos Naturales y Ambiente Humano 1995: 8).

The latter are of special importance due to their integrative and qualitative character. They should include:

- The character of the impact (positive / negative),
- The intensity of the impact (high, medium, low),
- The duration of the impact (permanent, transitional) and
- The possibility of restoring the initial situation (reversible, irreversible) (Secretaria de Recursos Naturales y Ambiente Humano 1995: 8).

In Argentina, the description of socio-economic and cultural aspects and related mitigation measures are included in the EIA process i.e. Social Impact Assessments are part of the EIA (Bastida 2002: 21f). **The Industrial Zoning and Environmental Classification Law** in the Province of Buenos Aires for instance, stipulates that the evaluation should also consider socioeconomic aspects, including population density and type, the effect of industrial activity on the population, uses of soil and available infrastructure (The American Chamber of Commerce in Argentina 2007: 39).

Additionally, the **National Institute for Indigene Interests** (Instituto Nacional de Asuntos Indígenas, INAI), a government body, works to support and defend indigenous communities and develop their full participation with respect to biodiversity issues (CBD 2007: 87).

In the oil and gas sector, impacts on biodiversity are addressed through the following instruments (as outlined in an article on the handling of biodiversity issues in the oil and gas industry; Palmada 2005):

- Environmental Management Systems (Sistemas de Gestión Ambiental, SGA),
- Environmental and Social Impact Studies (Estudios de Impacto Ambiental y Social, EIA / EIS),
- Biodiversity Monitoring Plans (Planes de Monitoreo de Biodiversidad, PMBs) and
- Biodiversity Action Plans (Planes de Acción de Biodiversidad, PABs) (Palmada 2005: 5).

Biodiversity issues can be integrated into different elements of Environmental Management Systems e.g. the Environmental Policy, which is a public commitment to protect biodiversity that recognises the potential impacts of the company's activities (including secondary impacts) and their mitigation (Palmada 2005: 5). Important steps in an EIA / EIS to ensure the proper management of biodiversity include definition of the methodology for site selection, the identification of alternatives in the context of biological aspects, the evaluation and analysis of primary and secondary impacts and preventive and mitigation options. A Biodiversity Action Plan allows a company to evaluate and understand the impact of its activities on biodiversity, and to establish a management plan to address these impacts (Palmada 2005: 6). Palmada (2005) concludes that EIA or EIS should start early, be participatory and consider the assessment and mitigation of primary and secondary impacts (Palmada 2005: 7). Ideally, socioeconomic aspects should be considered, as in many cases sensitive areas and primary forests are the natural habitat of indigenous communities (Palmada 2005: 7). There is an additional risk of claims and complaints, for two principal reasons: first, the direct effect on the local community of primary operational impacts; second, the impact on biodiversity in the area, which can in turn cause major impacts on the ability of native communities to meet their basic needs (especially with respect to hunting and fishing, farming, fruit gathering, etc.) (Palmada 2005: 7).

The oil industry has developed a range of tools, procedures and methodologies that support good environmental practice. The proper implementation of these ensures the appropriate handling of the direct impacts of routine activities. However there is much yet to be done with respect to secondary impacts, especially in sensitive areas (Palmada 2005: 7).

6.1.4 Determining significance and thresholds

With respect to the implementation of environmental management in Argentina, environmental impacts are prioritised according to different criteria with varying degrees of complexity:

- The probability of occurrence, i.e. the frequency with which an impact occurs. It may be pertinent to review the historical performance of an organisation as this may have a bearing on whether such impacts occur frequently or not,
- The severity of the impact, i.e. the magnitude of the impact; with the most relevant aspect being negative impacts on local communities,
- The scale of the impact refers to the area that is affected (influenced) by the impact,
- The concerns of interested parties,
- The duration of the impact, with some lasting a very short time while others may persist for many years or even centuries,
- The legal aspects that might lead to sanctions if the impact occurs,
- The costs and feasibility of remediation,
- The negative publicity and impacts on reputation that might result from the impact (Congreso Regional de Ciencia y Tecnología 2002: 13).

The magnitude and significance of environmental impacts can be measured using qualitative or quantitative methods (Secretaría de Recursos Naturales y Ambiente Humano 1995: 8). Interactions between the project impacts and the environment have to be considered and uncertainties should be clarified (Secretaría de Recursos Naturales y Ambiente Humano 1995: 7f).

Furthermore, the General Environmental Guide for Investment Projects requests the determination of a wide range of potential environmental impacts: positive and negative, direct and indirect, long-term and immediate, permanent and transitional, local and regional, reversible and irreversible etc. (Secretaría de Recursos Naturales y Ambiente Humano 1995: 7). Likewise the Industrial Zoning and Environmental Classification Law of the province of Buenos Aires draws out positive and negative, direct and indirect and reversible and irreversible impacts (The American Chamber of Commerce in Argentina 2007: 39).

6.1.5 Mitigation hierarchy

Article 41 of the Constitution repeatedly notes that causing environmental damage will give rise to the **obligation of recomposition**, according to what the law determines (Koolen 1996: 61). Article 1083 of the **Civil Code** supports this, aiming to **restore a damaged ecosystem to its previous state**, except where this is not possible, in which case financial compensation is necessary (**compensation payment**). The reparation of damage prioritises the recomposition of the environment rather than compensation payments (Koolen 1996: 61). The LGA takes as one of its general objectives the establishment of adequate procedures and mechanisms for (i) the minimisation of environmental risks, (ii) the prevention and mitigation of environmental emergencies and (iii) the restoration of impacts caused by environmental pollution (COFEMA 2006: 1).

There is a range of environmental management tools available (Bastida 2002: 18). These can be included in the different practices and processes that enable an organisation or business to manage its activities with respect to the environment. The activities aimed at controlling and mitigating the impacts

can be grouped into preventive and remedial measures (see Figure 12) (Congreso Regional de Ciencia y Tecnología 2002: 6). On the one hand, **preventive measures** are intended to avoid negative impacts on the environment occurring in the first place, which may be achieved through alternative technology or the reduction or elimination of specific pollutants and wastes. Examples may be eco-efficient design, good practice and clean technologies as well as recycling and reuse of waste products (Congreso Regional de Ciencia y Tecnología 2002: 7). On the other hand, **remedial measures** are used after an activity likely to lead to an impact has been implemented. Remedial measures can be divided into corrective and compensatory measures. **Corrective measures** try to cancel, correct, modify or attenuate negative impacts on the environment, while **compensatory measures** seek to compensate the harmful effects on the environment when these are unavoidable and irrecoverable, e.g. through payments for emissions and pollution (however, nothing is noted as to how these payments are spent) or the creation of green areas etc (Congreso Regional de Ciencia y Tecnología 2002: 7).

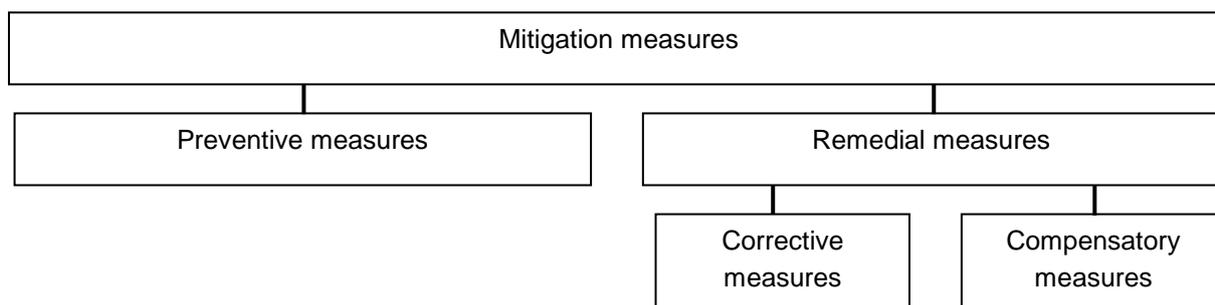


Figure 12: Types of mitigation measures

Source: after Congreso Regional de Ciencia y Tecnología 2002: 6f

The main tool adopted in Argentina is the **Environmental Management Plan** (Plan de Gestión Ambiental) which must be included in the EIA, containing “all the actions for mitigation, rehabilitation or recomposition aimed at correcting any future environmental impact, up to (permissible) limits, that the operator is committed to put in place” (Bastida 2002: 18, 24f). The Environmental Management Plan encompasses the formulation of measures for the mitigation and optimisation of significant impacts of the project (Secretaría De Ambiente Y Desarrollo Sustentable 1999:10). The following principles need to be taken into consideration:

- Formulation of adequate mitigation measures to prevent, correct or compensate negative environmental effects of the project,
- In cases where no mitigation measures are applied to address impacts, the project proponent must justify why,
- Correlation between the identified impacts and mitigation measures and
- Internal consistency and coherence between the mitigation measures (Secretaría De Ambiente Y Desarrollo Sustentable 1999:10).

Overall four aspects are of particular importance: the identified impacts, the designed mitigation measures, the timing and the entity responsible for the implementation of mitigation measures (Secretaría De Ambiente y Desarrollo Sustentable 1999: 10).

6.1.6 Determining offset demand and compensation measures

During research, no general information or guidance on the determination of offset demand was noted. Therefore, the EIA for the project "Rural Electrification in Productive Areas of the Province of Chaco" (see Figure 13) is presented below as an exemple.

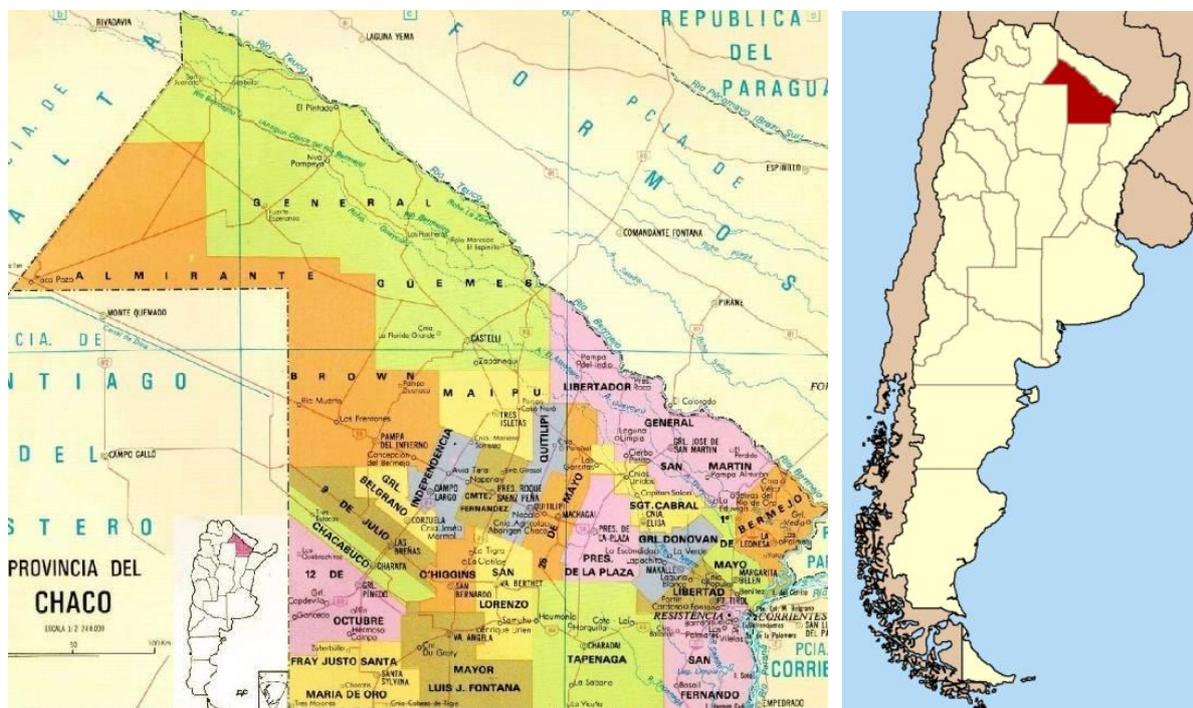


Figure 13: Location of Chaco Province

Source: País Global: Provincia del Chaco. Internet: <http://www.pais-global.com.ar/html/argentina/chaco/chaco01.htm>, Zugriff: 18.10.2008. Wikipedia: Chaco Province. Available at: http://en.wikipedia.org/wiki/Image:Provincia_de_Chaco,_Argentina.png, Accessed: 18.10.2008.

The project EIA aims to identify environmental changes that may occur in the area where works will be executed and propose measures for mitigating the negative impacts, including compensation for environmental liabilities. The EIA also contains an assessment of the positive environmental impacts that help strengthen the benefits of the project (Ministerio de la Producción de la Provincia de Chaco 2007: 1). The implementation of mitigation measures that have been identified initially and that might become apparent as the work progresses is the responsibility of the contractor. (Ministerio de la Producción de la Provincia de Chaco 2007: 51). The project's predicted negative environmental impacts are of varied significance, but given its characteristics almost all of these are rated as very low. For this reason, the environmental mitigation measures proposed in the EIA are generally preventive. This implies that the predicted impacts will not require major measures or the recruitment of complex services for their mitigation (Ministerio de la Producción de la Provincia de Chaco 2007: 38). Nevertheless mitigation measures need to be established to address the impact on flora and fauna and the fragmentation or alteration of habitats. This may be done through the adoption of an adequate methodology and a **Mitigation Plan for Negative Environmental Impacts** (Plan de mitigación de impactos ambientales negativos) (Ministerio de la Producción de la Provincia de Chaco 2007: 38, 39, 47). The Mitigation Plan includes a table, in which impacts and the related mitigation measures are presented, along with temporal and spatial conditions and the party responsible for implementation (Ministerio de la Producción de la Provincia de Chaco 2007: 48ff). With respect to the impacts of removing

vegetation cover, provisions are made regarding the compensation ratio, with five trees planted for each one cut down (Ministerio de la Producción de la Provincia de Chaco 2007: 48).

6.1.7 Implementation and responsibilities / costs

The rules of the Civil Code as related to the scope of repairing damages caused to a single person or their properties by the actions of a third party are laid down in Art. 901-903. Here, a distinction is made between “immediate consequences” that naturally occur within the course of an action and “mediate consequences”. Art. 903 states that the immediate consequences of actions are attributable to the creator of those actions (Koolen 1996: 52). Following the **guidelines of the Hazardous Waste Law**, Law No. 25,612 expands the liability established by the Civil Code to include a responsibility for damages caused by industrial waste despite its transformation or treatment (The American Chamber of Commerce in Argentina 2007: 12).

The **Environmental Framework Law** (LGA) fixes the responsibility and reparation of damage to biological diversity and establishes in its Articles 27-33 the norms for any licit or illicit action or omission that causes environmental damage (CBD 2007: 51). The liability for environmental damage (defined as any significant alteration which can modify adversely the environment, its natural resources, and the equilibrium of ecosystems, collective property or securities (Art. 27)) and the expectation that those who cause environmental damage will be responsible for restoration to the natural state, are fundamental elements of the LGA (FARN Greenpeace de Bosques Nativos 2006: 19). The originator of current or future degrading effects on the environment is responsible for the costs of preventive measures and corrective restoration independent of the validity of the liability for environmental systems (“polluter pays principle”) (COFEMA 2006: 2). Furthermore the LGA states that “any individual or legal entity performing activities hazardous to the environment must obtain an insurance which shall guarantee that any possible damages caused to the environment will be cured; likewise, on a case-by-case basis and depending on the possibilities, it may create an environmental restoration fund to instrument restoration actions” (The American Chamber of Commerce in Argentina 2007: 14).

Articles 34 and 35 of the LGA establish the need to create a public (Federal) **Environmental Compensation Fund** (Fondo de Compensación Ambiental), intended to ensure environmental quality and the prevention and mitigation of dangerous or harmful effects on the environment, the consideration of environmental emergencies, as well as the protection, preservation, conservation or compensation of ecological systems and the environment (The American Chamber of Commerce in Argentina 2007: 14; CBD 2007: 51; COFEMA 2006: 2, 5; Valls de Rossi n.d.: 5f). The risks involved in the development of anthropogenic activities and their potential negative impacts on both the environment and the welfare of people requires the operation of a fund to ensure the prevention and remediation of environmental liabilities and develop contingencies for immediate action if necessary (COFEMA 2006: 4f). This Environmental Compensation Fund will be administered by the competent authority in each jurisdiction, who will determine when such a fund may contribute to the costs of restoration actions that could minimise damage (COFEMA 2006: 5; Valls de Rossi n.d.: 6). The financial support of this fund should come mainly from the private sector (which is the major generator of environmental damages) and tending towards self-financing through the charging of fees, royalties or other environmental taxes. Additionally, the law (Art. 28 LGA) provides for indemnification (compensation payments), which are triggered when the restoration of environmental impacts is not possible and which will be added to the fund (Valls de Rossi n.d.: 6). Financial compensation is over and above the main function that the LGA specifically assigned to the fund: when real compensation (natural compensation) is impossible a compensation payment has to be made to the fund as a substitute. This shall be employed to offset the irreparable harm in accordance with a public policy that compensates the loss and prevents future damage of this kind, such as:

- Establishing a habitat or protected area for species that face the threat of extinction in other areas.
- Develop social campaigns for education and awareness raising amongst the general population, in order to address contamination caused by waste by reduction and recycling (Valls de Rossi n.d.: 7).

Example: Environmental Compensation Fund for the Matanza Riachuelo Basin

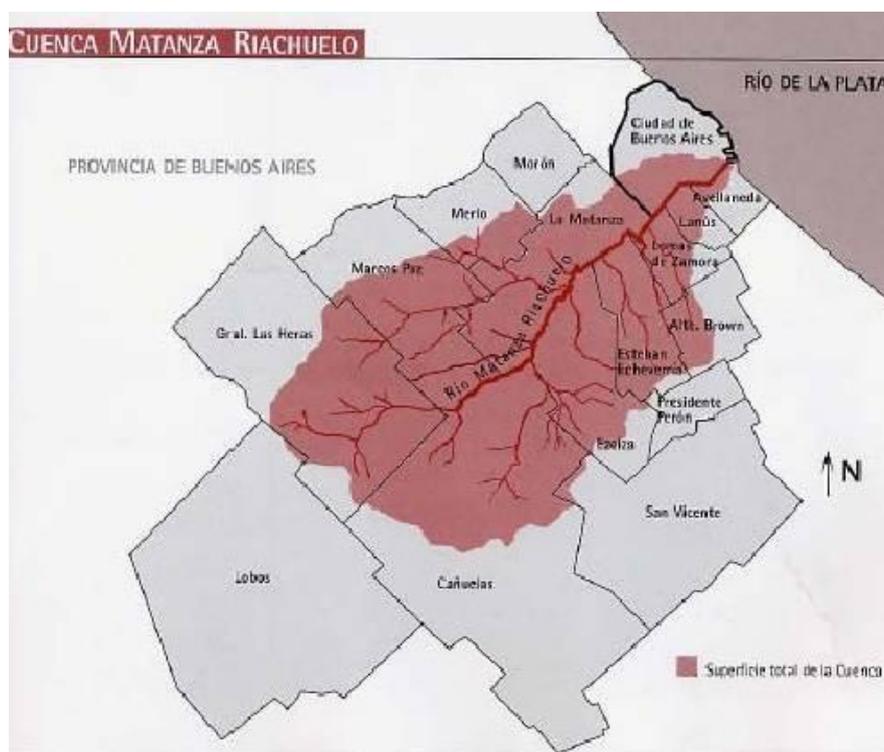


Figure 14: Matanza Riachuelo Basin

Source: Asociación de Vecinos La Boca: The Matanza-Riachuelo River Basin. Available at: <http://www.avelaboca.org.ar/english-011.php>, Accessed: 18.10.2008.

At a regional scale an Environmental Compensation Fund has been created for the Basin of Matanza-Riachuelo (see Figure 14), to cite one example, through legislation (**Ley de la Cuenca Matanza Riachuelo**). This fund, which will be managed by the Matanza-Riachuelo Water Basin Authority (ACUMAR) will be tasked with the protection of human rights and the prevention, mitigation and restoration of environmental damage (Art. 9) (Valls de Rossi n.d.: 12; Cámara de Diputados de la Nación Argentina n.d.: 5). According to Art. 9 to contributions to this fund include:

- Budgetary appropriations considered in the annual budget law prepared by the National Government,
- Proceeds from the collection of fines, rates and taxes provided by law,
- Environmental restoration compensation amounts as determined in court,
- Subsidies, donations or legacies,
- Other resources allocated by the National Government, the Province of Buenos Aires and the City of Buenos Aires and

- International credits (Cámara de Diputados de la Nación Argentina n.d.: 5; Valls de Rossi n.d.: 11f; The American Chamber of Commerce in Argentina 2007: 33).

Damage claims

The LGA states that the Ombudsman, environmental NGOs and the federal, provincial or municipal governments may request the restoration of the damaged environment. In addition, any person may demand that activities causing collective environmental damage be discontinued (The American Chamber of Commerce in Argentina 2007: 14).

Damage claims for environmental harm “may be (i) individual, in which case a specific party or interest may be compensated to remedy the actual injury or (ii) collective, in which case an environmental offence against the public warrants a remedy beyond direct compensation” (The American Chamber of Commerce in Argentina 2007: 48). Article 41 of the Federal Constitution, as well as the general principles of the Argentine Civil Code and the LGA seek to restore the environment to its status prior to the contaminating act and to compensate for harm to individuals (The American Chamber of Commerce in Argentina 2007). Furthermore, certain courts, particularly in the Province of Buenos Aires, have ordered parties to conduct not only environmental remediation for individual harm, but have also specified measures for avoiding future harm (The American Chamber of Commerce in Argentina 2007: 49).

6.1.8 Project case study: Yacyretá Hydroelectric Project II: raising environmental standards in started projects

The Yacyretá hydroelectric facility (see Figure 15) is one of the largest dams in Latin America covering huge areas of the Río Paraná between Argentina and Paraguay (see Figure 16) (Programa Argentina Sustentable 2005: 1; Quintero 2007: 30). The formal project initially dates back to 1973, while civil engineering began in 1983 and the site entered into service in 1994 (Programa Argentina Sustentable 2005: 1). The site was selected and established by the Yacyretá Binational Treaty and subsequently has been considered a poor choice (by experts and others), due to its location in the flood plain of a major river and the high ratio of people displaced and inundated area per MW produced (19 people and 53 hectares respectively per MW) (Quintero 2007: 30). A joint publication of the Argentine Sustainability Programme (Programa Argentina Sostenible PAS), Conosur Sustentable, the Coalition for Vital Rivers (Coalición Ríos Vivos) and the Heinrich Böll foundation describes the Yacyretá Hydroelectric project as a huge failure due to the tremendous damage that it has caused, the irrecoverable funds that were invested or diverted during its construction, and its failure to meet its goal of improving the quality of life for the relevant populations and “bringing development and cheap energy to the region” (Programa Argentina Sustentable 2005: 1).



Figure 15: Yacyretá hydroelectric facility

Source: Entidad binacional de Yacyretá: Visita virtual al complejo Yacyretá. Internet: http://www.yacyreta.org.ar/index.php?option=com_content&task=view&id=95. Zugriff: 18.10.2008.

The project objectives were extended to bring it into compliance with the new policies as far as possible and to offset the impacts caused, most notably through the adoption of operational packages relating to Environmental Assessment and Natural Habitats. In this context the Yacyretá II project focuses on the Resettlement and Environmental Management Plan, attributing primary importance to natural habitats and social conditions (Quintero 2007: 30).



Figure 16: Location of Yacyretá hydroelectric facility in Río Paraná

Source: Secretaría de Turismo de la Nación: Posadas and Yacyretá. Available at: <http://www.turismo.gov.ar/eng/attra/tour/REG1/RU11.HTM>, Accessed: 18.10.2008.

The project impacts both on riparian and terrestrial habitats, mostly forested savanna and wetlands, affecting high-priority ecoregional areas and endangered species. Moreover, the hydrological characteristics of the river have been completely transformed, creating a new lake and changing the flow regime which has generated particular impacts on the aquatic fauna and fisheries (Quintero 2007: 31). Specific concerns that led inevitably to the Natural Habitats Policy were:

- Loss of riparian habitats, notably the forests,
- Loss of potamic habitats, particularly the disappearance of the river islands and rapids,
- The desiccation of the Aña Cuá branch, which would further threaten the remaining river island ecosystems and riparian areas,
- The effects on several endemic and endangered species, such as the saffron-cowled blackbird (see Figure 17) and the *Aylacostoma* snail, and
- The interruption of fish migrations (Quintero 2007).

To cope with these impacts an aggressive, comprehensive ecological compensation programme was established, enabling the project team to carry out more extensive operational adjustments, biodiversity programmes and other measures (Quintero 2007: 34). In this way a complex of new and extensive compensation measures was developed to assure adequate environmental standards including:

- A network of twelve new compensatory protected areas,
- Landscape reconfiguration of borrow pits,
- Increased water flow on the Aña Cuá branch to maintain a nearly natural state year-round,
- A fish elevator to maintain the gene pool in upstream fish populations,
- Ex-situ conservation of endemic snails,
- Fish regulations to avoid overexploitation of stock aggregations below the dam,
- Water monitoring to ensure good water quality in the lake and
- A programme to find, protect and maintain suitable habitats for the endangered saffron-cowled blackbird (Quintero 2007: 29).



Figure 17: Saffron-cowled blackbird

Source: Earnshaw, A.: Photos of Blackbirds. Available at:
<http://www.fotosaves.com.ar/Passeriformes/Icteridae/FotosIcteridae.html>, Accessed: 18.10.2008.

The compensation measures relate to the type of habitat affected, distinguishing between habitats located on land or in the river. To address the loss of terrestrial habitats the task was to match the inundated area with similar protected habitats by improving the environmental conditions of surrounding terrestrial areas that were not flooded, so that they would be suitable for local flora and fauna (Quintero 2007: 32). Most significantly, a network of protected areas was established that encompasses an area larger than that lost to inundation while guaranteeing the participation of local communities in the management and conservation of these areas (Quintero 2007: 34). The hydrological compensation programme was developed to ensure long-term conservation of river habitat and wetland areas dependent on seasonal flow fluctuations by means of minimising changes in the hydrological regime (Quintero 2007: 33).

Associated management plans and a permanent monitoring programme aim to guarantee the long-term viability and sustainability of the measures. Management and monitoring activities include:

- Surveillance of the lake to ensure that it does not develop into an anoxic environment (and thus cause the death of aquatic life),
- Control of invasive aquatic plants,
- Prevention of increases in insect populations and
- Monitoring of water quality (Quintero 2007: 33).

The institution responsible for the project is the Entidad Binacional Yacyrethá (EBY) (notwithstanding the other actors that have contributed to the project in the past decades). The World Bank has been involved since the late 1970s adopting new policies, particularly the Environmental Assessment and Natural Habitats Safeguard policies (Quintero 2007: 29). Furthermore, NGOs that are experts in specific relevant fields are contracted by EBY (e.g. to carry out long-term management of protected areas).

The costs of compensation measures and management plans have been incorporated into the operating costs of the dam, to ensure that funds remain available throughout the project's lifetime, for instance US\$ 300,000 will be spent annually on management expenses (Quintero 2007: 32). Funds to support the protected areas and finance biodiversity programmes have been established by incorporating a portion of the revenues earned from electricity sales to a special allocation set up by EBY (Quintero 2007: 33).

The case of the Yacyrethá Hydroelectric project shows that interventions – even when adverse conditions are at an advanced stage – can significantly reduce impacts to biological diversity through adequate compensation and restoration measures and thus contribute to the conservation of habitats (Quintero 2007: 29, 34). The approach adopted to funding via the incorporation of conservation-related expenses in the fixed costs of operating the dam is a good example of how institutions can be made financially responsible for recurrent environmental costs arising from the services they provide, throughout the lifetime of the project (Quintero 2007: 34).

6.1.9 Critical discussion

A problem with the implementation of the aforementioned legal provisions is the **federal organised political and administrative structure** of the country. This implies a division of power and competencies between the national authorities and the 23 provincial authorities who have control over their natural resources. The dual federal and provincial jurisdiction on environmental matters has led to an overlap of federal and provincial regulatory agencies, making it sometimes difficult to determine which governmental agency should intervene in a particular case. The **lack of coordination** and the duplica-

tion of environmental agencies often results in a **failure to act and enforce the law**. This in particular is the case for the control of liquid effluent discharges (The American Chamber of Commerce in Argentina 2007: 31).

Concrete examples of compensation in practice were difficult to identify. One example is the Environmental Impact Assessment (EIA) of the Project "Rural Electrification in Productive Areas of the Province of Chaco" (as noted above). Avoidance, mitigation and compensation are subsumed under the term 'mitigation measures' and are established to address the impact on flora and fauna and the fragmentation or alteration of habitats. They are displayed in a table against the impacts and the corresponding temporal and spatial conditions and those responsible for their implementation. This integrated approach may lead to a **lack of application of the mitigation hierarchy**. Taking the removal of vegetation cover as an example, the planting of five trees for each one that has been removed is fixed as compensation measure. However, it is unclear whether all appropriate measures to avoid or minimise the cutting of trees must be considered before proposing compensation.

The Yacyretá hydroelectric project aimed to create one of the largest dams in Latin America in the Río Paraná between Argentina and Paraguay. After a disastrous start more than thirty years ago, later extensive compensation measures were designed as part of the ecological compensation programme following execution of EIAs. The measures are broken down to the level of single endangered key species such as the saffron-cowled blackbird. Still, this comprehensive example might be an exception, as it is a huge project which was developed with support of the World Bank. The **practical implementation of compensation measures for small-scale projects remains doubtful**.

The Environmental Compensation Fund as an instrument for compensation and financing was identified at different geographical scales, with the Federal Environmental Compensation Fund at national level and the Environmental Compensation Fund for the Matanza-Riachuelo Basin at regional level. Nevertheless little information could be identified with respect to the **operation of these funds and the development and implementation of tangible compensation measures**.

In general, implementation with respect to biodiversity issues appears to be a problem. Programmes and projects that consider biological diversity exist, but **outcomes are poorly published**. Additionally the **baseline information on landscape and biological diversity is only available and applied in a rudimentary form** (Lencinas 2008).

6.2 Selected aspects of impact mitigation regulation in Brazil

6.2.1 Scope and objectives

The growing concern in relation to biodiversity issues within the last two decades manifested itself most notably in the adoption of the Convention on Biological Diversity (CBD) during the United Nations Conference on Environment and Development held in Rio de Janeiro in June, 1992. Brazil was a leading promoter of this formal instrument for biodiversity conservation. Considered a “megadiverse” country holder by far of the largest biodiversity on earth, it is not surprising that Brazil was the first signatory to the convention and has developed diverse legislation, policies and initiatives regarding biological diversity and environment issues. In Brazil, the CBD is implemented through the **National Biodiversity Policy**, set up by decree 4439/2002 (Ministry of Science and Technology, Secretariat for Policy and Programs on Research and Development 2006: 11). It defines thematic guidelines in terms of seven components referring to the main clauses of the CBD. Among these, components three and four are of special importance for this study. On the one hand component three addresses the “Sustainable Use of Biodiversity Components” and “gathers directives for the sustainable use of biodiversity and biotechnology, including the strengthening of public management, the establishment of economic mechanisms and instruments, and the support of sustainable practices and ventures which ensure maintenance of biodiversity and ecosystem functions, considering not only the economic value, but also the social and cultural values of biodiversity”. On the other hand, component four focuses on “Monitoring, Assessment, Prevention and Mitigation of Impacts on Biodiversity” and “contains directives for the strengthening of systems for monitoring, assessing, preventing and mitigating impacts on biodiversity, as well as to promote restoration of degraded ecosystems and over-exploited biodiversity components” (Ministry of Science and Technology, Secretariat for Policy and Programs on Research and Development 2006: 12f).

Furthermore, Brazil established **National Biodiversity Targets for 2010** (see Table 2), in line with the framework of global targets and indicators, which was approved for the 7th Conference of the Parties to the CBD in 2004, to guide and monitor the implementation of the CBD 2010 Target (Brazilian Ministry of the Environment 2007: 1f).

Table 2: Brazilian National Biodiversity Targets for 2010

Source: Brazilian Ministry of the Environment 2007: 4f.

Protect the components of biodiversity
<i>Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats and biomes</i>
Target 1.1 At least 10% of each of the world’s ecological regions effectively conserved.
Target 1.2 Areas of particular importance to biodiversity protected.
<i>Goal 2. Promote the conservation of species diversity</i>
Target 2.1 Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups.
Target 2.2 Status of threatened species improved.
<i>Goal 3. Promote the conservation of genetic diversity</i>
Target 3.1 Genetic diversity of crops, livestock, and of harvested species of trees, fish and wildlife and other valuable species conserved, and associated indigenous and local knowledge maintained.
Promote sustainable use
<i>Goal 4. Promote sustainable use and consumption</i>
Target 4.1 Biodiversity-based products derived from sources that are sustainably managed, and production areas managed consistent with the conservation of biodiversity.
Address threats to biodiversity
<i>Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced</i>
Target 5.1 Rate of loss and degradation of natural habitats decreased.

<i>Goal 6. Control threats from invasive alien species</i>
Target 6.1 Pathways for major potential alien invasive species controlled.
Target 6.2 Management plans in place for major alien species that threaten ecosystems, habitats or species.
<i>Goal 7. Address challenges to biodiversity from climate change, and pollution</i>
Target 7.1 Maintain and enhance resilience of the components of biodiversity to adapt to climate change.
Target 7.2 Reduce pollution and its impacts on biodiversity.
Maintain goods and services from biodiversity to support human well-being
<i>Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods</i>
Target 8.1 Capacity of ecosystems to deliver goods and services maintained.
Target 8.2 Biological resources that support sustainable livelihoods, local food security and health care, especially of poor people maintained.
Protect traditional knowledge, innovations and practices
<i>Goal 9 Maintain socio-cultural diversity of indigenous and local communities</i>
Target 9.1 Protect traditional knowledge, innovations and practices.
Target 9.2 Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit-sharing.
Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources
<i>Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources</i>
Target 10.1 All access to genetic resources is in line with the Convention on Biological Diversity and its relevant provisions.
Target 10.2 Benefits arising from the commercial and other utilization of genetic resources shared in a fair and equitable way with the countries providing such resources in line with the Convention on Biological Diversity and its relevant provisions.
Ensure provision of adequate resources
<i>Goal 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention</i>
Target 11.1 New and additional financial resources are transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20.
Target 11.2 Technology is transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with its Article 20, paragraph 4.

During the last decade Brazil has initiated and implemented numerous programmes and projects that have the aim of conserving biological diversity and supporting the sustainable use of natural resources. Table 3 presents a selection of the most important recent examples.

Table 3: Conservation and sustainable use projects in Brazil

Project or Programmes	Scope and objectives
National Biodiversity Strategy Project	<ul style="list-style-type: none"> • Follows CBD objectives and specific Brazilian needs (Ministry of Environment 2005: 14). • Strategy allows the elaboration of biodiversity policies and strategies at state and local levels (Ministry of Environment 2005: 14). • Preparation of Action Plans to implement the National Biodiversity Policy (Ministry of Environment 2005: 15).
Project for the Conservation and Sustainable Use of Brazilian Biological Diversity (PROBIO – Projeto para a Conservação e Utilização Sustentável da Diversidade Biológica Brasileira)	<ul style="list-style-type: none"> • Central objective: provide assistance to the Federal Government of Brazil in the development of the National Biodiversity Program (PRONABIO) through: implementation of demonstrative subprojects; production and dissemination of information and knowledge about biodiversity; identification of priorities for action and the facilitation of partnerships between the public and private sectors (Ministry of Environment 2008: 7). • Project published a public notice in August 2004 as part of the selection of an institution to implement the “Inventory of the remaining vegetation fragments of the Atlantic Forest biome”. • Inventory will generate important information for the development of public policies on the conservation and sustainable use of biological diversity in

	the country (Ministry of Environment 2005: 50).
National Program on Micro-watersheds and Soil Conservation in Agriculture	<ul style="list-style-type: none"> • Conducted by the Ministry of Agriculture, Ranching and Provisioning (Ministry of Environment 2005: 15f). • Main objectives: promoting integrated sustainable rural development, using the micro-watershed as a planning unit; supporting the social organisation of producers; promote better agriculture productivity and the use of environmentally, socially and economically adequate technologies (Ministry of Environment 2005: 15f). • Priority actions include: restoration of riparian forests and protection of fragile areas; Restoration of degraded areas (Ministry of Environment 2005: 15f).
Biodiversity Research Program (PPBio – Programa de Pesquisa em Biodiversidade)	<ul style="list-style-type: none"> • Main objectives: promoting research development; training of human resources; institutional strengthening for research on biological diversity. • In agreement with the Directives of the National Biodiversity Policy (Ministry of Environment 2005: 16).
BIOTA Program / FAPESP	<ul style="list-style-type: none"> • Main objectives: conduct the inventory of, and characterise, the biodiversity within the state of São Paulo, defining mechanisms for its conservation, economic potential, and sustainable use (Ministry of Environment 2005: 27). • As of 2005, BIOTA had 32 projects being implemented, 13 completed projects and 4 under evaluation (Ministry of Environment 2005: 27).
Project for the Preservation of the Atlantic Forest (PPMA – Projeto de Preservação da Mata Atlântica)	<ul style="list-style-type: none"> • Aims to conserve and sustainably manage the biodiversity contained in the remaining fragments of the Atlantic Forest and associated ecosystems in the state of São Paulo (52 municipalities) (Ministry of Environment 2005: 30). • Main actions: to re-equip the executing units; implement infrastructure works; coordinate environmental monitoring and licensing actions; planning of joint enforcement operations between PPMA and the Pró-Atlântica programme of Paraná state; establishment of a forest management system; elaboration / update of management plans (Ministry of Environment 2005: 30f).
Program for the Conservation, Sustainable Use and Recuperation of Biodiversity	<ul style="list-style-type: none"> • Objective is to define and conserve biological diversity, and promote the sustainable use of its components (Ministry of Environment 2005: 51).
TAMAR Project (National Program for the Conservation and Research of Marine Turtles)	<ul style="list-style-type: none"> • Successful initiative to promote the recovery of the population of a specific endangered animal species. • Resulted in the proliferation of other initiatives to protect threatened species: Centers for wildlife conservation of the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA); instances of recovery of endangered species; updating of the endangered species list (Ministry of Environment 2005: 65).
Program of Protected Areas in the Amazon (ARPA – Programa Áreas Protegidas na Amazônia)	<ul style="list-style-type: none"> • Federal Government programme with a planned duration of ten years (Ministry of Environment 2005: 72). • Objective is to expand, consolidate and maintain a part of National System of Conservation Units (SNUC – Sistema Nacional de Unidades de Conservação) in the Amazon Biome, protecting at least 50 million hectares and promoting the sustainable development of the region (Ministry of Environment 2005: 72). • Co-financed by KfW.
Protected Areas Program in Brazil	<ul style="list-style-type: none"> • Objective is to expand and consolidate the National System of Conservation Units and other protected areas, aiming to protect Brazilian biodiversity and fairly distribute the derived benefits (Ministry of Environment 2005: 72).
Management of Riparian	<ul style="list-style-type: none"> • Project executed by IBAMA and coordinated by the Ministry of the Environ-

Natural Resources Project (PROVARZEA – Projeto Manejo dos Recursos Naturais da Várzea)	<p>ment.</p> <ul style="list-style-type: none"> • Objective is to establish scientific, technical and political bases for the conservation and environmentally and socially sustainable management of riparian natural resources along the central channel of the Amazon watershed, emphasising fisheries resources (Ministry of Environment 2005: 143).
Brazilian Program of Bio-prospection and Sustainable Development of Biodiversity Products (PROBEM – Programa Brasileiro de Bioprospecção e Desenvolvimento Sustentável de Produtos da Biodiversidade)	<ul style="list-style-type: none"> • Executed by the Secretariat for Sustainable Development of the Ministry of the Environment (MMA – Ministério do Meio Ambiente). • Programme provides incentives for the sustainable economic exploitation of biodiversity, given due consideration to the directives of the Convention on Biological Diversity (Ministry of Environment 2005: 150f).
Environmental Petrobrás Program	<ul style="list-style-type: none"> • Objective is to develop and support initiatives involving: public awareness building and promotion of the sustainable use of freshwater; contribution to hydrological resource management; restoration of forests around water bodies, including the protection of headwaters; species preservation actions, particularly for threatened species; Brazilian social mobilisation to promote the importance of habitats and species of marine fauna and flora.
Forest Certification Program (Cerflor – Programa de Certificação Florestal)	<ul style="list-style-type: none"> • Executed by the Brazilian Institute for Meteorology, Normalization and Industrial Quality. • Objectives are to establish the specific rules for forest certification; support the training of forest auditors; study possible funding sources to fund the forest certification of properties / businesses; and to supervise and evaluate programme implementation (Ministry of Environment 2005: 153).
PRONAF – Programa Nacional de Fortalecimento da Agricultura Familiar	<ul style="list-style-type: none"> • Rural credit line of the National Program for Strengthening Family Agriculture. • Encourages the adequate management of natural resources, stimulating the planting of forest species, supporting rural family producers in the implementation of sustainable management projects of multiple use, reforestation and agro-forestry systems, providing incentives for the preservation of national forests and restoration of degraded areas, with environmental planning and regulation of rural properties (Ministry of Environment 2005: 298).
PPG7	<ul style="list-style-type: none"> • Brazilian government programme that was developed following encouragement by, and a proposal from, the Group of Seven (G7), which comprises the world's most industrialized countries (Ministry of the Environment 2002: 74). • Objectives are to contribute to the conservation of the rainforests' genetic resources, to reduce the contribution of the Brazilian forests in carbon global emissions and to provide an example of cooperation between developed and developing countries in addressing global environmental issues (Ministry of the Environment 2002: 74).

The **National Environmental Policy Act** (Lei da Política Nacional do Meio Ambiente, LPNMA), enacted in 1981, is the basis for the Brazilian Environmental Policy and established the **National Environment System** (Sistema Nacional do Meio Ambiente, SISNAMA), comprising federal, state and local government authorities (Escorcio Bezerra 2007: 30). In terms of biodiversity conservation, Art. 225 of the **Brazilian Federal Constitution** (CRFB, 1988) is the most important legal text provision, highlighting the right that everyone has to an “ecologically well-balanced environment” on the one side and the shared responsibility of government and the entire community to protect the environment on the other (Escorcio Bezerra 2007: 31). The most important tasks according to the CRFB are:

- Art. 225, 1st paragraph, I: to “preserve and restore the essential ecological processes and provide for the ecological treatment of species and ecosystems” (Escorcio Bezerra 2007: 31; Protected Areas Department 2008: 27f),
- Art. 225, 1st paragraph, II: to “preserve the diversity and integrity of the genetic patrimony of the country” (Escorcio Bezerra 2007: 31),
- Art. 225, 1st paragraph, III: to define “territorial spaces and their components which are to receive special protection” (Escorcio Bezerra 2007: 31),
- Art. 225, 1st paragraph, IV: to “require, in the manner prescribed by law, for the installation of works and activities which may potentially cause significant degradation to the environment, a prior environmental impact study, which shall be made public” (Escorcio Bezerra 2007: 31),
- Art. 225, 1st paragraph, V: to “[...] control the production, commercialization, and employment of techniques, methods, and substances that comprise risk to life, life quality, and the environment” (Ministry of Environment 2005: 63) and
- Art. 225, 1st paragraph, VII: to protect the fauna and flora, preventing, under the rule of law, those practices that place their ecological function at risk, cause the extinction of species, or submit animals to cruelty” (Ministry of Environment 2005: 53).

There are various legal texts and provisions related to biological diversity and the environment, including Law 10257 of 10 July 2001 which includes, in item XII of paragraph 2, environmental protection, preservation and restoration, as important items in urban planning and regulation (Ministry of Environment 2005: 15) and the **Law of Environmental Crimes** regulating criminal and administrative punishments for behaviour and activities that cause harm to the environment (Ministry of Environment 2005: 53). However, regarding biodiversity compensation there are two main legal arrangements: the **Forest Code** and the **SNUC Act (National System of Conservation Units Act)**. Related to these two different mandatory approaches for biodiversity compensation are in place: The “forest set-aside offset” building on the provisions in the Forest Code and the “project developers’ offset” which is closely linked to the environmental licensing system and environmental impact assessment (Escorcio Bezerra 2007: 36, 46).

The Forest Code (Law 4771/1965) established the concepts of **permanent preservation areas (APP)** and **legal forest reserves (LFR)** (Ministry of the Environment 2002: 69; Protected Areas Department 2008). According to the **Presidential Provisional Act no. 2166-67** a permanent preservation area is defined as “a protected area, whether covered or not by native vegetation, with the environmental role of preserving the water resources, the landscape, the geological stability, the biodiversity and the genetic flow of fauna and flora in addition to protecting the soil and ensuring the well-being of human populations” (Ministry of the Environment 2002: 70). Therefore permanent preservation areas have to be maintained as an “untouchable space with a permanent environmental function” and exempt from removal of vegetation which, by way of exception, can only be done with the prior authorisation of the responsible environmental authority and with an accompanying obligation to adopt compensatory measures (Ministry of the Environment 2002: 70).

A legal reserve is defined by the aforementioned Act no. 2166-67 as “the rural property area necessary for the sustainable use of natural resources, the conservation and restoration of ecological processes, the conservation of biodiversity and for the refuge and protection of native fauna and flora. In these areas, the vegetation cannot be removed, but it can be used under the sustainable management system” (Ministry of the Environment 2002: 70). Art. 16 of the Forest Code requires that rural landowners must maintain a fixed minimum percentage of natural vegetative cover on their property, ranging from 20% to 80% depending on the region, the clearing of which is prohibited (Escorcio Bezerra

2007: 34) (Ministry of the Environment 2002: 69). According to Art. 44, landowners who do not comply with these provisions are obligated to undertake the following measures:

- Replant vegetation to comply with their property LFR obligation,
- Allow the natural regeneration of vegetation and / or
- Compensation (Escorcio Bezerra 2007: 34f).

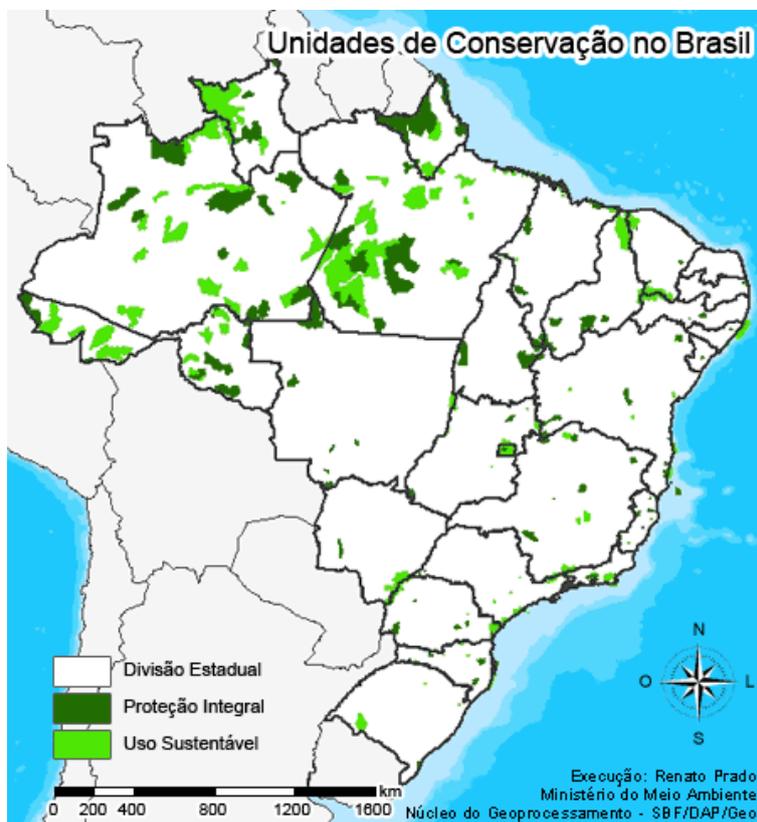


Figure 18: Units of Conservation in Brazil

Source: Como funcionam as unidades de conservação? Available at:

http://www.artigosbrasil.com.br/noticia/?nr_pg_atual=9&id=165851. Accessed: 18.10.2008.

Law no. 9985/2000 (SNUC Act) created the **National System of Conservation Units (SNUC)** which aims to establish, administer, maintain and enhance protected areas (Units of Conservation – UCs, see Figure 18). The SNUC Act sets out objectives (see Table 4), guidelines and structure for the system, organising it around twelve management categories, divided into a ‘full protection areas’ group and a ‘sustainable use protected areas’ group, each of which include several management categories (Protected Areas Department 2008: 20, 29).

The **project developers’ offset approach** integrates environmental licensing provisions and the SNUC Act. The funds, necessary for the establishment and maintenance or enhancement of protected areas, come from compensation payments for investment projects as required by the environmental licensing system.

Law no. 6938 (Resolution no. 001/86 from the **National Environment Council, CONAMA**) imposed the requirement for activities that affect the environment to undertake an EIA, including the preparation of an **environmental impact report** (Relatório de Impacto Ambiental, RIMA) and the related **envi-**

ronmental impact study (Estudo de Impacto Ambiental) in order to obtain a license (Ministry of Environment 2005: 201). With regard to adverse impacts on the environment and biological diversity the SNUC Act forces the enterprise to support the implementation and maintenance of Units of Conservation (Petrobras n.d.). The SNUC Act includes as its first objective the maintenance of biodiversity, and thus is aligned with the “no net loss principle”, although this is not specifically mentioned (this was confirmed through interviews with experts).

Table 4: SNUC Act

Source: Ministry of the Environment 2002: 41; De Oliveira Maciel ; Filho n.d.

<p>Art. 4: objectives</p> <ul style="list-style-type: none"> • To contribute to maintaining the biological diversity and genetic resources, • To protect endangered species, • To contribute to the preservation and restoration of the natural ecosystems diversity, • To promote the sustainable development based on the natural resources, • To promote the use of principles and practices for the conservation of nature in the process of development, • To protect the natural landscapes of remarkable scenic beauty which are not very altered by human activities, • To protect the relevant characteristics of the geological, geomorphological, speleological, archaeological, paleontological and cultural nature, • To protect and restore water and edaphic (soil) resources, • To recover and restore degraded ecosystems, • To provide means and incentives for activities of scientific research, studies and environmental monitoring, • To value the biological diversity both economically and socially, • To foster conditions and to promote environmental education and interpretation, leisure in contact with nature and ecological tourism, • To protect the natural resources necessary to the livelihoods of the traditional populations, respecting and valuing their knowledge and culture and promoting them both socially and economically.
<p>Art. 36</p> <p>In cases of environmental licensing of undertakings of significant environmental impact, thus considered by the responsible environmental body, based on Environmental Impact Assessment and respective report, the entrepreneur is obliged to support the implementation and maintenance of the Units of Conservation of the Group of Integral Protection, in accordance with the provisions of this article and the regulation of this law.</p> <ul style="list-style-type: none"> • § 1: The amount of resources to be destined to the SNUC by the undertaking entrepreneur is determined by the environmental licensing body, according to the degree of environmental impact caused by the venture.

Decree no. 4340/2002 (SNUC Decree) regulates the SNUC Act, with respect to compensation for relevant environmental impacts (Protected Areas Department 2008: 29).

One of the merits of the SNUC Act is the inclusion of the **Private Natural Heritage Reserves** (Reservas Particulares do Patrimônio Natural, RPPN) in the SNUC, thus strengthening the integration of

reserves located on private estates into the country's protected areas strategy (Protected Areas Department 2008: 20).

Alongside the compulsory mechanisms, voluntary economic and private approaches to environmental conservation and compensation are emerging. Even though Brazil has not yet developed the legal framework for the development and implementation of incentive measures to promote biodiversity conservation and the sustainable use of natural resources, there are already some mechanisms and pilot projects or programmes in place (Ministry of Environment 2005: 163). The **green VAT** is one example, where local authorities receive a two percent bonus from the VAT when they renounce land use in newly designated protected areas (Stachetti Rodrigues 2008). Thus, the green VAT significantly contributes to expanding protected areas. Another example is water management, which is at a more advanced stage (Ministry of Environment 2005: 167). These approaches seek to place an economic value on biological diversity, which is the basis for acceptable insertion of biodiversity into market systems. Additionally, biological diversity issues are addressed through integration with initiatives addressing climate change, e.g. creating a benefit for biodiversity through carbon fixation in forests. Voluntary carbon neutralization, e.g. via the planting of trees to address the ecological footprint of television emissions is attracting growing interest (Inhetvin 2008). Furthermore, several initiatives exist that relate to **payment for environmental services** (e.g. the **Proambiente Program** – see case study below) and certification (e.g. the **Brazilian Program of Forest Certification** – Programa Brasileiro de Certificação Florestal, CERFLOR).

6.2.2 Components of biodiversity and natural resources covered / measured

CONAMA Resolution 001/86 stipulates that with respect to EIA a complete description and analysis of environmental resources and their interactions has to be developed, distinguishing between:

- The physical environment: underground, water, air and climate, with special attention to mineral resources, topography, soil types and aptitudes, water bodies, hydrological regime, marine currents and atmospheric currents,
- The biological environment and natural ecosystems: fauna and flora, with special attention to species which are indicators of environmental quality, species of scientific and economic value, rare and endangered species, and permanent preservation areas, and
- The socio-economic environment: soil use and occupancy, water use, and socio-economy, with special attention to archaeological, historical and cultural sites and monuments, any dependency of local communities on environmental resources, and the potential future use of these resources (Ministry of Environment 2005: 206f).

Eco-certification and weighed Environmental Impact Assessment for rural activities

The objective of the **APOIA-NovoRural System** is to promote eco-certification standards for agricultural production, combining competitiveness and sustainable management. It consists of a set of 62 integrated environmental indicators built into scaling checklists, designed to systematically assess five dimensions of sustainability:

- Landscape ecology,
- Environmental quality (atmosphere, water and soil),
- Socio-cultural values,

- Economic values and
- Management and administration.

The rural establishment comprises the spatial scale of assessment, which is performed by quantitatively and analytically evaluating the effects of the rural activity on each and every indicator constructed for these five dimensions, and automatically calculating the impact indexes, according to appropriate weighting factors (Stachetti Rodrigues et al. n.d.: 5).

Another system for the eco-certification of rural activities is the **Eco-cert.Rural System**, which integrates 24 criteria (see Table 5) and 125 indicators of the social and environmental performance of an agricultural technology or activity (Stachetti Rodrigues et al. n.d.: 5). These criteria and indicators are presented in scaling checklists aimed at favouring the selection of best management practices in the context of local resource availability and environmental constraints (Stachetti Rodrigues et al. n.d.: 5). Using a similar approach, in 2002 the **Brazilian Geography and Statistics Institute** (Instituto Brasileiro de Geografia e Estatística IBGE) developed a series of indicators to monitor the sustainability of the Brazilian development standards, using environmental, social, economic and institutional dimensions (Ministry of Environment 2005: 146).

Table 5: Dimensions and criteria for Socio-environmental Impact Assessment in the Eco-cert.Rural system

Source: Stachetti Rodrigues et al. n.d.: 4

Ecological Performance	
Use of Inputs and Resources	<ul style="list-style-type: none"> • Use of agricultural inputs and resources • Use of veterinarian inputs and raw materials • Use of energy
Environmental Quality	<ul style="list-style-type: none"> • Atmosphere • Soil quality • Water quality • Biodiversity • Environmental restoration
Socio-Environmental Performance	
Customer Respect	<ul style="list-style-type: none"> • Product quality • Production ethics
Employment	<ul style="list-style-type: none"> • Training • Opportunity and qualification for local employment • Job Generation and engagement • Employment quality
Income	<ul style="list-style-type: none"> • Net income generation • Income sources diversity • Land value
Health	<ul style="list-style-type: none"> • Personal and environmental health • Occupational safety and health • Food safety and security
Management and Administration	<ul style="list-style-type: none"> • Farmer capability and dedication • Trade arrangements • Waste disposal • Institutional relationship

Another classification of the components of biological diversity refers to the different types of protected areas, as defined by the SNUC Act, as shown in Table 6.

Table 6: Categories of protected areas

Source: Ministry of Environment 2005: 66

Integral Protection	Sustainable Use
<ul style="list-style-type: none"> • National Park • Biological Reserve • Ecological Station • Natural Monument • Wildlife Refuge 	<ul style="list-style-type: none"> • Environmental Protection Area • Area of Relevant Ecological Interest • Extractive Reserve • National Forest • Wildlife Reserve • Sustainable Development Reserve • Private Natural Heritage Reserves

6.2.3 Methods for valuation and quantification of potential impacts

The Brazilian Federal Constitution requires the development of a “**prior environmental impact study**” for projects potentially having adverse impacts (see Chapter 7.1). According to Resolution 001/86 this comprises, amongst others, investment projects for railways, pipelines for oil, gas and minerals, hydraulic facilities for the use of water resources (dams, irrigation projects, dikes, etc.), mineral extraction, industrial districts, and exploitation of forestry (wood resources) in areas greater than 100 hectares (Egler n.d.: 321f). The EIA process in Brazil encompasses the development of an environmental impact study (Estudo de Impactos Ambientais) and its related environmental impact report (Relatório de Impactos Ambientais, RIMA) (Egler n.d.: 321). Processing of this information is controlled by resolution SMA-42/1994, including review of the EIA and RIMA, project analysis and licensing (see Secretary of the Environment 1994).

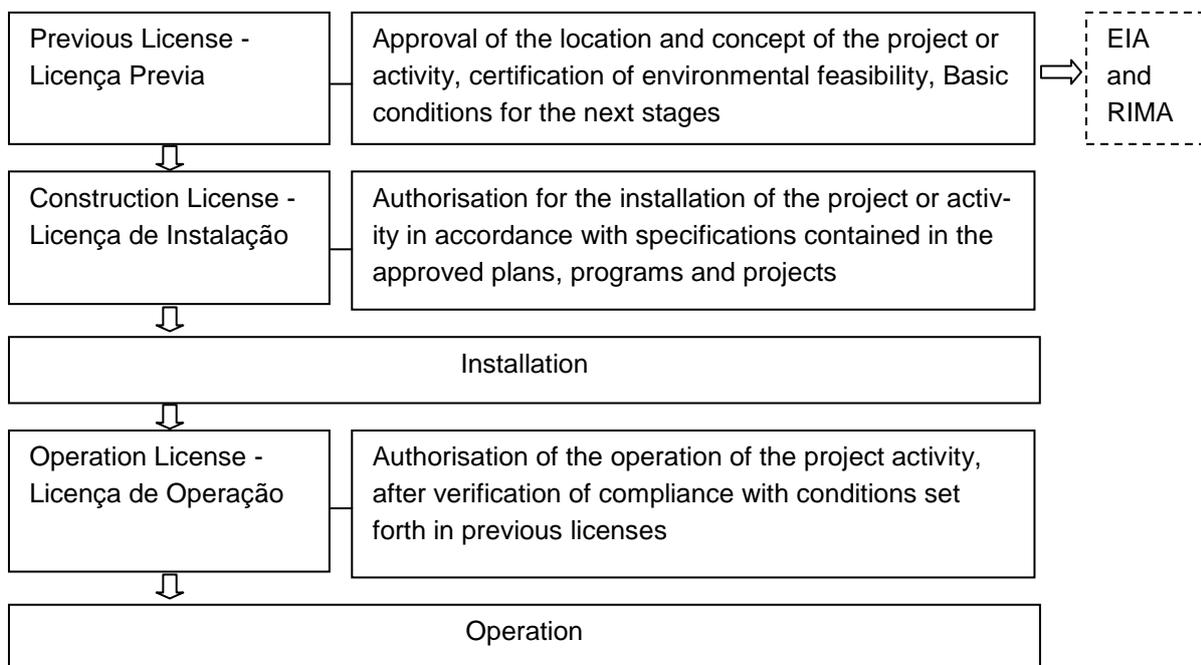


Figure 19: The Brazilian licensing system

Source: Escorcio Bezerra 2007: 52

The licensing procedure builds on three sequential processes (Escorcio Bezerra 2007: 32) as shown in Figure 19. The responsibility for the licensing procedure is held by IBAMA, the **Brazilian Institute of Environment and Renewable Natural Resources** (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis) at federal level and by the state / municipal environmental authorities.

The consideration of socioeconomic issues is integrated into the EIA.

Several projects exist that aim to integrate the concerns of indigenous people into biodiversity conservation and sustainable use. Decree no. 4339/ 2002 stipulates the participation of indigenous peoples and other communities in the decision-making processes as a principle for the implementation of the National Biodiversity Policy (Ministry of Environment 2005: 120). The federal government is seeking to increase their participation and the protection of traditional knowledge through the inclusion of their representatives in a number of relevant councils e.g. the Genetic Heritage Management Council (CGEN), the National Biodiversity Commission (CONABIO) and the National Environmental Council (CONAMA) (Ministry of Environment 2005: 120, 123; Ministry of the Environment 2002: 16).

There are also pilot projects that try to assess the value of biodiversity in order to facilitate measuring impacts on and losses of biological diversity. The value of biodiversity is determined using a number of parameters, related to “direct and indirect use value, non-use and future use value and also the intrinsic value man attributes to it”, for example, ecological, genetic, social, economic, scientific, educational, cultural, leisure and aesthetic values (Ministry of the Environment 2002: 16; CEFET-Campos; UNED-Macaé n.d.). The concept of **Economic Total Value** (ETV) has been developed, linked to a case study of a production water pipeline through the Jurubatiba National Park. The approach highlights the influence that biological diversity has on various human interests, for instance the provision of basic goods for the livelihood of human beings, food and medicinal plants and symbolic aspects (CEFET-Campos; UNED-Macaé n.d.). The economic valuation procedure is based on a total value comprised of the sum of five valuation components multiplied by a social factor (see Figure 20).

$$\begin{array}{r}
 \text{Total Value of} \\
 \text{biodiversity}
 \end{array}
 =
 \begin{array}{c}
 \text{opportunity loss} \\
 + \\
 \text{scenic impact} \\
 + \\
 \text{eco-systemic impact} \\
 + \\
 \text{visitation loss} \\
 + \\
 \text{environmental risk}
 \end{array}
 \times
 \text{social factor}$$

Figure 20: Estimating the total economic value of biodiversity

Source: after CEFET-Campos; UNED-Macaé n.d.

Similar studies have been undertaken by the “**Training and Development of Economic Analysis Studies on the Valuation of Biodiversity**” organised by the National Association of Graduate Centers in Economics (ANPEC) in partnership with IBAMA, the Brazilian Company for Agricultural and Animal Husbandry Research (EMBRAPA) and the São Paulo State Secretariat of the Environment. With different sub-projects and two case studies it aims to institutionalise economic-environmental analyses of investments within Brazilian environmental institutions (Ministry of Environment 2008: 58).

6.2.4 Determining significance and thresholds

No definition exists with respect to significant impacts. Therefore the environmental impact study has to identify any (potential) physical, chemical and biological alteration of environmental properties, caused by any form of human activities which, directly or indirectly, affect the environment (Ministério do Meio Ambiente 2008). The determination of significance during the EIA process requires consideration of a number of impacts on health, safety, well-being, social and economic activities, biota, the environment and natural resources (World Bank n.d.):

- Positive and negative,
- Direct and indirect,
- Short, medium and long-term,
- Temporary and permanent,
- Cumulative, synergistic and distributional.

Determining the significance of impacts can result in projects being rejected and not executed. These kinds of restrictions may apply, for example, to legal reserves under the Forest Code, where the removal of more than a fixed amount of vegetation cover is prohibited, and project developers’ offset, which must seriously consider the “no-go” option (Escorcio Bezerra 2007: 47).

In the state of Minas Gerais, for environmental compensation (project developers’ offset) the impact significance is determined using the following indicators:

- Matrix of impacts,
- Vegetal covering,
- Proximity of units of conservation,
- Energy efficiency,
- Reduction of outflows,
- Polluting potential,
- Risk analysis,
- Index of deposit exploitation and
- Additional quality parameters (Vieira de Almeida n.d.: n. pag.).

The impact significance is then related to a minimum percentage of costs for compensation measures as outlined in Table 7.

Table 7: Percentage of investment for compensation measures based on impact significance in the state of Minas Gerais

Source: Vieira de Almeida n.d.: n. pag.

Framing of the enterprise (according to Normative deliberation COPAM no. 074/2004)	Degree of the environmental impact	Percentage of investment for compensation measures
Class 3	I	0,5 %
Class 4	II	0,75 %
Class 5	III	1,0 %
Class 6	IV	1,25 %

6.2.5 Mitigation hierarchy

The National Biodiversity Policy (Política Nacional de Biodiversidade) highlights the need for efficient mitigation measures of short, medium and long term to address current deficiencies (referring to Art. 14 CBD on impact assessment and mitigation) (Ministério do Meio Ambiente 2008: n. pag.). Some examples for possible mitigation measures are:

- Continuous monitoring of the changes that have occurred in the geographical areas covered by biomes and main Brazilian ecosystems,
- Continuous monitoring of endangered species diversity,
- Establishment of standards and criteria for the identification and monitoring of ecosystems and endangered species (“Red List”),
- Restoration and rehabilitation of ecosystems,
- Recuperation of degraded areas with native species,
- Environmental Impact Assessment of projects and development actions, particularly on the biological diversity,
- Monitoring, prevention and deforestation programme,
- Monitoring, prevention and fighting of forest fires,
- Creation or expansion of incentives for recycling and reduction of demand on biological resources,
- Execution of studies and research on the causes of degradation and components of biological diversity (Ministério do Meio Ambiente 2008: n. pag.).

For the mitigation hierarchy there is a fundamental difference between the two mandatory biodiversity compensation approaches in Brazil: whereas the **forest set-aside offset** has no direct correlation to the mitigation hierarchy principle, the **project developers’ offset** is inseparably linked to it (Escorcio Bezerra 2007:43, 46). This link results from the association of the latter with the environmental licensing system and Environmental Impact Assessment, which requires the application of the mitigation hierarchy. This includes considering all the technological and location-related alternatives for the project, including its non-implementation (Egler n.d.: 322). Mitigation measures have to be defined for the negative impacts of projects, considering and assessing control and monitoring efficiency (Egler n.d.: 322f). Finally, when applying the mitigation hierarchy, biodiversity offsets are seen as a “last resort” (Escorcio Bezerra 2007: 47).

6.2.6 Determining offset demand and compensation measures

Forest Set-Aside Offset

Art. 16 of the Forest Code requires rural landowners to maintain a fixed minimum percentage of natural vegetative cover on their property (Escorcio Bezerra 2007: 37). This minimum percentage is fixed by Provisional measure no. 2166-67/2001 and is calculated according to the region:

- Art. 16, I: 80% for rural properties in the Amazon forest,
- Art. 16, II: 35% for rural properties in the Cerrado of the Amazon region (savannah),
- Art. 16, III and IV: 20% for rural properties in forest and agricultural areas in all other regions of Brazil (Medida Provisória no. 2.166-67 2001).

The maintenance of these legal reserves is compulsory, allowing only sustainable forest management, and prohibiting clear felling for use as grazing or cultivation areas. According to Art. 16 § 4 of the Forest Code (amended by Provisional measure no. 2166-67/2001) the location of the legal reserve has to be approved by the competent environmental authority of the state or municipality or any other duly qualified institution, taking into consideration the social function of the property and the following criteria or instruments:

- The plan of the water basin / watershed (plano de bacia hidrográfica),
- The municipal master plan (plano diretor municipal),
- Environmental and economic zoning (zoneamento ecológico-econômico),
- Other environmental zoning categories, and
- The proximity of other legal reserves, permanent preservation areas (APP), Units of Conservation or other legally protected areas (Medida Provisória no. 2.166-67 2001).

The fundamentals of environmental compensation for forest set-aside offsets are laid down in Art. 44 of the Forest Code, which stipulates that the owner of a rural property who does not comply with the minimum percentages of native vegetation cover as set out in Art. 16 I-IV must undertake the following measures (either singly or jointly):

- I: recompose the legal reserve of the property through plantation with native species (every three years, at least one-tenth of the necessary complementary area has to be planted, in accordance with the criteria established by the competent state environmental authority),
- II: conduct regeneration of the legal reserve and
- III: compensate the legal reserve with another area with equivalent ecological importance, if it belongs to the same ecosystem and is located in the same micro-basin (Medida Provisória no. 2.166-67 2001).

Following these provisions, the Brazilian forest set-aside offset is mainly built on the concept of off-site offsetting (Escorcio Bezerra 2007: 39). However, emphasis is placed on in-kind solutions by requiring that the offset is of the same type of ecosystem within the watershed (Escorcio Bezerra 2007: 37). In cases where this is impossible due to a lack of natural vegetation, the offset should be as close as possible to the rural property seeking compliance with the legal minimum percentage and within the same river basin and State (Escorcio Bezerra 2007: 37). These off-site offsets can be implemented either by renting areas under forest services or by the acquisition of a **legal forest reserve quota** (LFR Quota) (Art. 16 § 5, Medida Provisória no. 2.166-67 2001).

According to Art. 44A the owner of a rural property can institute forest services, through which the right to suppress or explore the native vegetation outside of legal reserves is relinquished, permanently or temporarily (Medida Provisória no. 2.166-67 2001). These can only be provided by landowners who are already complying with their properties' LFR obligations and who are willing to create additional areas equivalent to legal forest reserves in order to lease these to other landowners who are not in compliance with the fixed minimum percentage (Escorcio Bezerra 2007: 38).

Art. 44B established the LFR Quota (Cota de Reserva Florestal), a title representing preserved native vegetation, either under the typical LFR regime (but voluntarily established), the LFR Equivalent Area regime or under the regime of a Reserva Particular do Patrimônio Natural (one specific SNUC conservation unit), in order to exceed the required percentages of Art. 16 (Escorcio Bezerra 2007: 39; Medida Provisória no. 2.166-67 2001). The LFR Quota operates third party offsets, which may eventually evolve into formal banking arrangements with government oversight, which are under discussion at state level. One outcome of this offset system is "condominium" arrangements where groups of landowners establish a private conservation bank, in order to compensate for their collective liabilities off-site (Escorcio Bezerra 2007: 39).

Whichever offset is proposed, it must be approved by the competent environmental authority prior to its implementation (Escorcio Bezerra 2007: 38), in order to guarantee:

- The "no net loss principle" of habitat,
- The pre-eminence of in-kind equivalence and
- The additionality of the offset (Escorcio Bezerra 2007: 43f).

Project Developers' Offset

The project developers' offset seeks to compensate for the residual impacts on biodiversity (that is, those that remain after application of the mitigation hierarchy – avoidance and mitigation of potential impacts) as part of the environmental licensing process. The second Brazilian biodiversity offset arrangement is closely linked with EIA. Art. 36 of the SNUC Act and Art. 31 of its related decree no. 4340/2002 (SNUC Decree) underline the function as a "last resort" (Escorcio Bezerra 2007: 41). They provide that developers of projects for which EIA and RIMA are required must offset their residual environmental impacts by supporting the establishment and maintenance of conservation units through a payment to the SNUC. According to Art. 36 § 1 this amount must be fixed at the **minimum rate of 0.5% of the total costs** of the development (see chapter 6.2.10 for current development to abolish this rate), adjusted in accordance with the degree of impact established by the environmental licensing authority during prior studies (Escorcio Bezerra 2007: 39f). The CONAMA Resolution no. 371/2006 establishes general criteria for the calculation, charging, expenditure, approval and auditing of the offset amount (Escorcio Bezerra 2007: 42). Nevertheless, detailed guidance for determining the offset amount is lacking and thus the amount is fixed on a case-by-case basis by the responsible environmental authority, with rates exceeding the minimum 0.5% (Escorcio Bezerra 2007: 40). For example, in the state of Minas Gerais an additional factor of 0.2% is required for projects having adverse impacts in exceptionally valuable areas, such as:

- Areas of extremely or very high biological importance (according to the document "Biodiversidade em Minas Gerais – Um Atlas para sua Conservação"),
- Areas of occurrence, transit or reproduction of endemic, rare or vulnerable species or species threatened with extinction and

- Areas within a 5 km distance of the borders of Units of Conservation of the Group of Integral Protection (which entail absolute nature conservation and do not allow economic activities within their boundaries) (Vieira de Almeida n.d.: n. pag.).

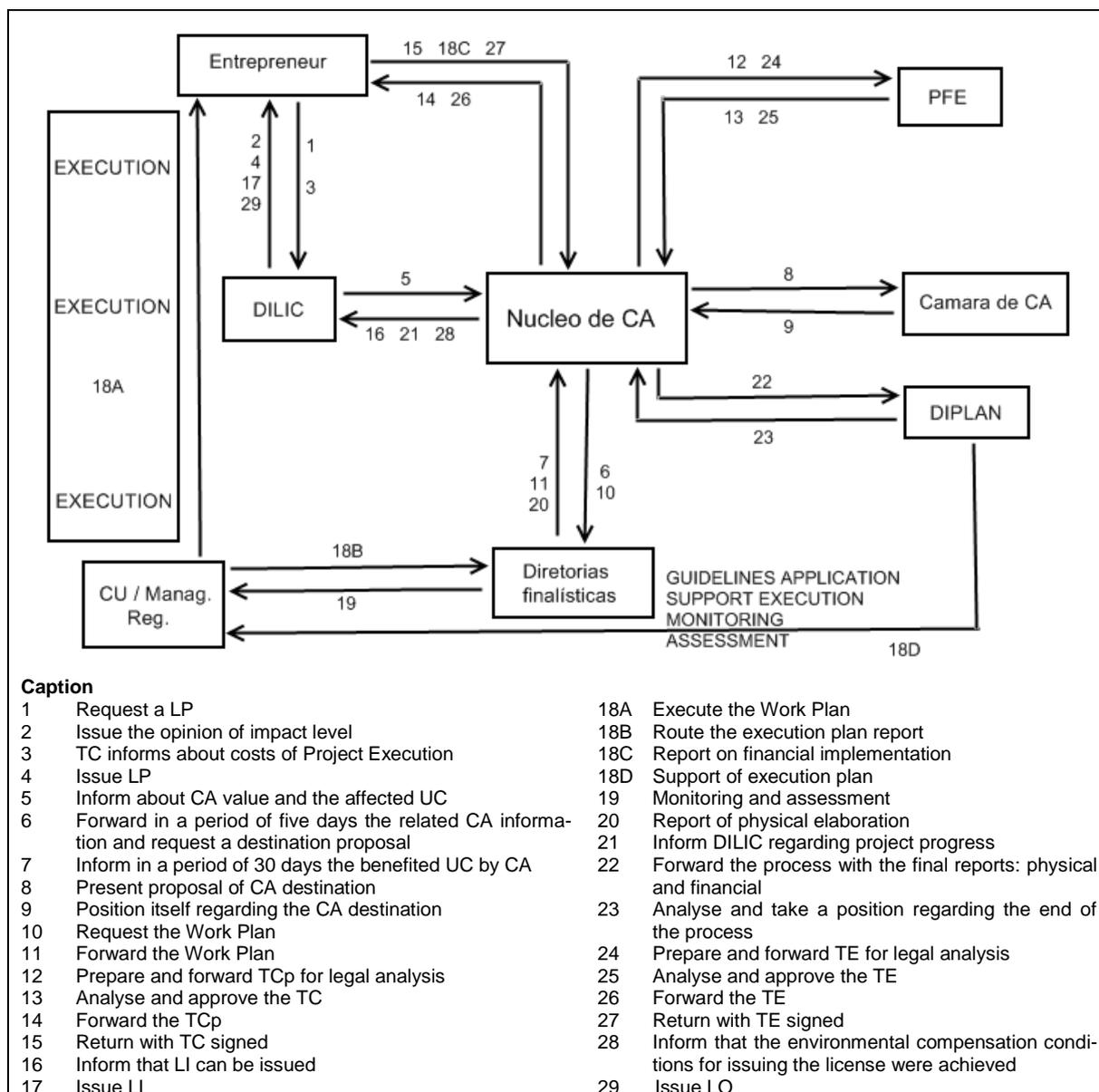


Figure 21: Process of environmental compensation according to project developers' offsets in Brazil

Source: Fonseca n.d.: n. pag.

The compensation payment must go to financing the creation, implantation or maintenance of the Units of Conservation of (Darwin Alonso 2006: 8). According to Art. 36 § 3 of the SNUC Act the offset may be directed to any Units of Conservation of the Group of Integral Protection within the SNUC, with the exception that if the development directly impacts a specific conservation unit or its buffer zone this unit must be benefited by the payment. The responsible environmental body makes the final decision as to how the money is spent (Escorcio Bezerra 2007: 40). According to Art. 33 of the SNUC Decree, regulating Art. 36 of the SNUC Act, the money may be spent in existing or newly created Units of Conservation for the following purposes (in order of priority):

- Land tenure regularisation and land demarcation,

- Elaboration, revision or implementation of a management plan,
- Acquisition of the goods and services necessary to establish, manage, monitor and protect the conservation unit, including its buffer zone,
- Studies necessary for the creation of a new conservation unit, and
- Development of the research necessary to manage the conservation unit and its buffer zone (Ministry of Environment 2005: 89; Escorcio Bezerra 2007: 41f).

The project developers' offset builds on off-site and out-of-kind compensation, while the obligation of the polluter is limited to an offset payment, without necessarily being involved in the implementation of compensation measures (Escorcio Bezerra 2007: 44f) (see Figure 21).

6.2.7 Implementation and responsibilities / costs

In Brazil a diverse system of funding exists to ensure the conservation and remediation of biological diversity. The **National Environment Fund** (Fundo Nacional de Meio Ambiente, FNMA) is the main instrument within the Brazilian federal government for the implementation of the National Environmental Policy and for complying with international environmental agreements and conventions to which Brazil is a signatory (Ministry of Environment 2005: 238f). Similar funds exist at state level (Ministry of Environment 2005: 241). For example, the **State Environment Fund** (Fundo Estadual do Meio Ambiente, FEMA) in the state of Goiás is a legal instrument "to manage financial and budget resources to support programs, projects and activities related to the rational and sustainable use of environmental resources [...] based on the principle of integrated and participatory environmental management, providing transparency for governmental actions related to the environment. [...] The financial resources managed by FEMA come from the payment of licenses, fees, taxes and fines applied by the environmental control activities, and from budget allocations from the State General Budget, as well as from compensations, loans, donations, subventions, grants, transfers, and interest from investments on the financial market" (Ministry of Environment 2005: 241). Other funds include those provided by the Global Environment Facility (GEF), the **O Boticário Foundation for Nature Protection** and **Brazilian Biodiversity Fund** (Fundo Brasileiro para Biodiversidade, FUNBIO) (Ministry of Environment 2005: 91). In the context of funding for protected areas, the **Protected Areas Fund** (Fundo de Áreas Protegidas, FAP) was created in 2006 by the **ARPA Program** as an endowment fund (only financial returns are used) to ensure the long-term financial sustainability of protected areas (Department of Protected Areas; Ministry of Environment n.d., n. pag.; Protected Areas Department 2008: 108). Other sources contributing to the SNUC are federal funding sources, the budget of the Ministry of the Environment, the National Environmental Fund, the **Environmental Compensation Fund** and international cooperation funds. Among these, the Ministry of Environment highlights environmental compensation as the most promising area for covering the needs of the protected areas (Protected Areas Department 2008: 105).

The Environmental Compensation Fund

The Environmental Compensation Fund (Fundo de Compensação Ambiental, FCA) was created in 2006 to enhance the efficiency of compensation payments under the project developers' offset approach (related to environmental licensing and the SNUC Act) (Ministry of the Environment n.d.: 65; Ministry of the Environment 2007: 20). This fund is the result of a partnership between IBAMA and the **National Savings Bank** (Caixa Econômica Federal, CAIXA) and has the goal of providing an alternative means of implementing the obligations contained in the SNUC Act (IBAMA; Câmara de Compen-

sação Ambiental 2006: 3). The FCA is an investment fund restricted to the application of resources from environmental compensation and is composed of federal public securities (80%) and private securities of low credit risk (20%) (IBAMA; Câmara de Compensação Ambiental 2006: 3), and is managed by CAIXA (Ministry of the Environment n.d.: 65).

Before the creation of the FCA, the entrepreneur was directly responsible for the execution of environmental compensation measures, using its own staff or contracting third parties (IBAMA; Câmara de Compensação Ambiental 2006: 3). Now, the entrepreneur may choose between direct execution or alternatively deposit the compensation payment at the FCA. In doing so the entrepreneur automatically confers the financial execution upon the responsible body at IBAMA, which is the **Chico Mendes Institute for Biodiversity Conservation** (Instituto Chico Mendes de Conservação da Biodiversidade, ICMBio)² (Ministry of the Environment n.d.: 65; Ministry of the Environment 2007: 20). The FCA results in advantages both for the entrepreneur and the government authorities: the former is exempt from the obligation to acquire goods and hire services and products that are not directly related to the enterprises' activities (such as management plans), while the latter has more control over financial activities and higher capacity with respect to expenditure planning and financial resources execution (Ministry of the Environment n.d.: 65; Ministry of the Environment 2007: 20). This is mainly due to the fact that the operation of the FCA by the bank is associated with a range of services aimed at implementing the actions of environmental compensation, which entrepreneurs could choose to not partake in (IBAMA; Câmara de Compensação Ambiental 2006: 3). These comprise:

- **Administration and control of the operation**, including the development of financial projections and the control of the availability of the FCA,
- **Web portal purchases**, an online system that allows, through the Internet, the purchase of goods and services, as defined in Article 24 of the Law on Public Tender (Lei de Licitações e Contratos, 1993) via bidding processes or direct purchase,
- **Public management**, a new type of service which includes support for the planning, implementation, monitoring and fiscalisation of programmes, projects and public policies, according to the priority actions defined in Art. 33 of the SNUC Decree, and
- **"Gov corporativo caixa"**, which ensures the monitoring and control of single accounts and the FCA as a whole (IBAMA; Câmara de Compensação Ambiental 2006: 4).

The costs of the services offered by CAIXA are taken from the environmental compensation payment, which means that there is no additional expense for the entrepreneur. The administration fee of FCA is 0.3% per annum on the assets of the fund, which is deducted from the value available to be applied (IBAMA; Câmara de Compensação Ambiental 2006: 4).

One part of the returns of the fund is kept as a Contingency Reserve (20%). The remaining 80% is assigned to the **Environmental Compensation Chamber** and applied through the Programme for Structuring the Integral Protection Conservation Units and other programmes (IBAMA; Câmara de Compensação Ambiental 2006: 4) – see Figure 22.

² The ICMBio was created through Provisional measure no. 366/2007 due to the need to enhance the effectiveness and efficiency of national policy for biodiversity. It is responsible for suggesting, implementing, managing, protecting, inspecting and monitoring protected areas, including environmental compensation aspects (Ministry of the Environment n.d.f: 23).

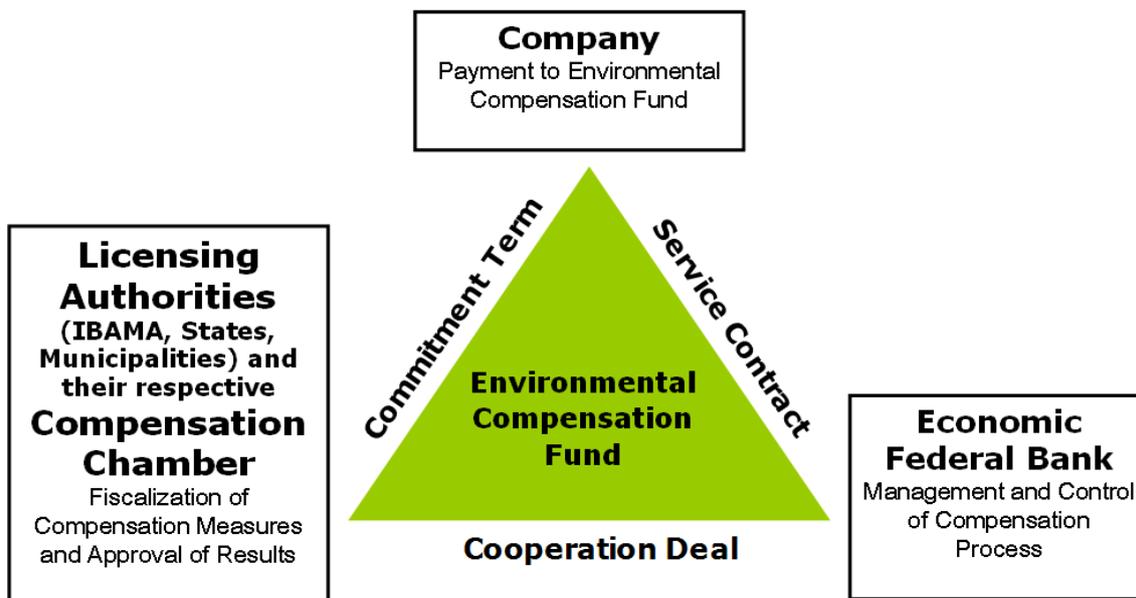


Figure 22: Relevant parties involved and their responsibilities under the Environmental Compensation Fund

Source: after IBAMA; Câmara de Compensação Ambiental 2006

General procedure of the FCA

After calculation of the compensation value and signing of the **Agreement Term** (Termo de Concordância) by the entrepreneur, the **Executive Secretary of the Environmental Compensation Chamber** at ICMBio (Secretaria Executiva da Câmara de Compensação Ambiental)³ provides the destination of the resources, according to the priorities established by law. Subsequently the **Commitment Term** (Termo de Compromisso) is signed by the entrepreneur and the authority; this contains a clause requiring concomitant membership of the FCA. By joining the FCA the entrepreneur opens a specific bank account in the National Savings Bank. The entrepreneur may choose to engage the services of the bank (as mentioned above) for the implementation of actions. In this case, the entrepreneur will have a **Contract for the Provision of Services** with the bank (IBAMA; Câmara de Compensação Ambiental 2006: 5). On completion of the defined activities the authority will issue a **Closure Term** (Termo de Encerramento) (IBAMA; Câmara de Compensação Ambiental 2006: 6).

Economic funding instruments

In Brazil there is a state tax on services and products (ICMS) and several states have established a tax return mechanism from the ICMS revenue to municipalities based on environmental criteria, known

³ Art. 32 of the SNUC Decree requires the creation of Environmental Compensation Chambers within environmental agencies, in order to analyse and propose the implementation of environmental compensation, define the percentage and the destination of the resources (Escorcio Bezerra 2007: 41f). At the federal level the Environmental Compensation Chamber was created within the Chico Mendes Institute for Biodiversity Conservation.

as the ecological tax “ICMS Ecological” (Ministry of the Environment 2007: 12). According to the Brazilian Federal Constitution, resources from this tax are divided between the state (75%) and municipal governments (25%) (Ministry of the Environment 2007: 12). Each municipality decides how to use the amount acquired, but when the state law considers the environmental scoring of each municipality, for the calculation of the tax distribution between municipalities, those municipalities with more protected areas receive higher tax returns from the ecological tax (Ministry of the Environment 2007: 12). These additional amounts of resources do not necessarily have to be used for the management of protected areas, however, municipalities which invest more in protected areas are rewarded with increased tax returns (Ministry of the Environment 2007: 12).

Other economic mechanisms are forest concessions, the collection of fees for water services provided by protected areas and carbon offsets (Protected Areas Department 2008: 108f).

6.2.8 Project case study: Proambiente Program

Whereas it is possible to physically define large enterprises (such as sugar cane and palm oil industries in the north of Brazil) and assign fiscal responsibility to them, it is virtually impossible to check and follow up the status of the millions of smallholdings, as well as to provide conditions to **small farmers** to fully implement the Forest Code and EIA legislation (Stachetti Rodrigues 2008). This context was the starting point for the **Proambiente Program**, which was initiated by the farm worker association in the mid-1990s (Inhetvin 2008). The Program adopts a **preventive and corrective approach**. Many small farms (up to 100 ha) focus on rural agrarian reform projects and are often **non-compliant** with, for example, the requirements of **legal reserves** because they have been established in already deforested areas. When they enter the Proambiente Program they receive financial and technical support to **reinststate natural vegetation** and preserve ecologically important fauna etc. (Stachetti Rodrigues 2008). The organisation of the Program is summarised in Figure 23.

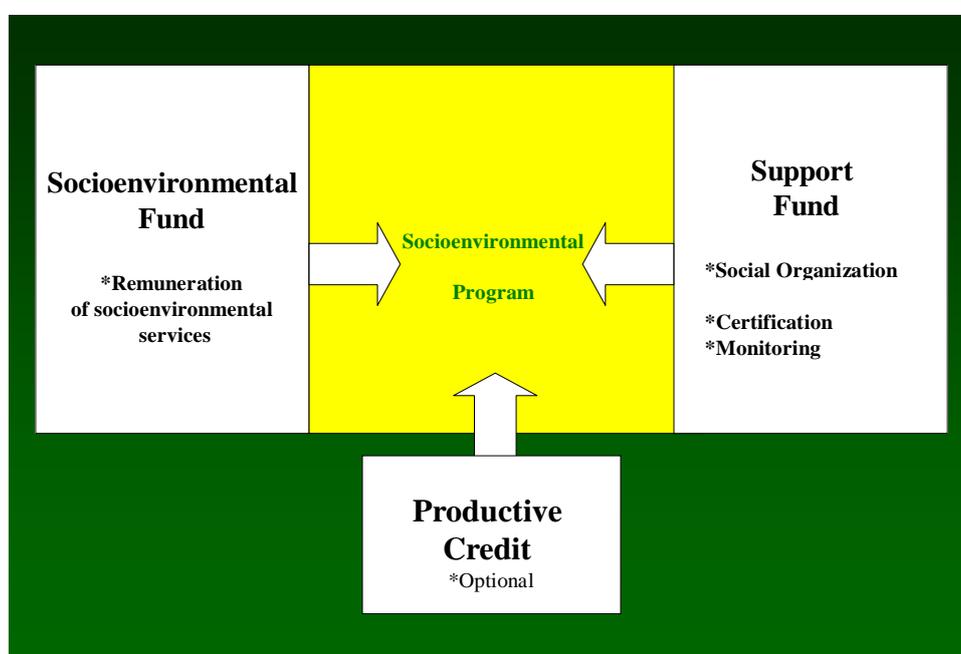


Figure 23: Organisation of the Proambiente Program

Source: Fontes Hirata 2006: 16.

Proambiente is a program of **environmental services** led by the **Ministry of the Environment** with contributions from the Ministry for Agrarian Development (Inhetvin 2008). It encourages the maintenance of native ecosystems by the **local population** through the **harmonisation of rural production and environmental protection** (Bittencourt et al. 2008: 22). The environmental services provided by the program include the reduction of deforestation, improved carbon sequestration, water and soil conservation, biodiversity preservation and fire risk reduction, with the following objectives:

- Support for environmental conservation,
- Coverage of environmental costs,
- Remuneration for environmental services and
- Social and technical support for socio-environmental certification (Bittencourt et al. 2008).

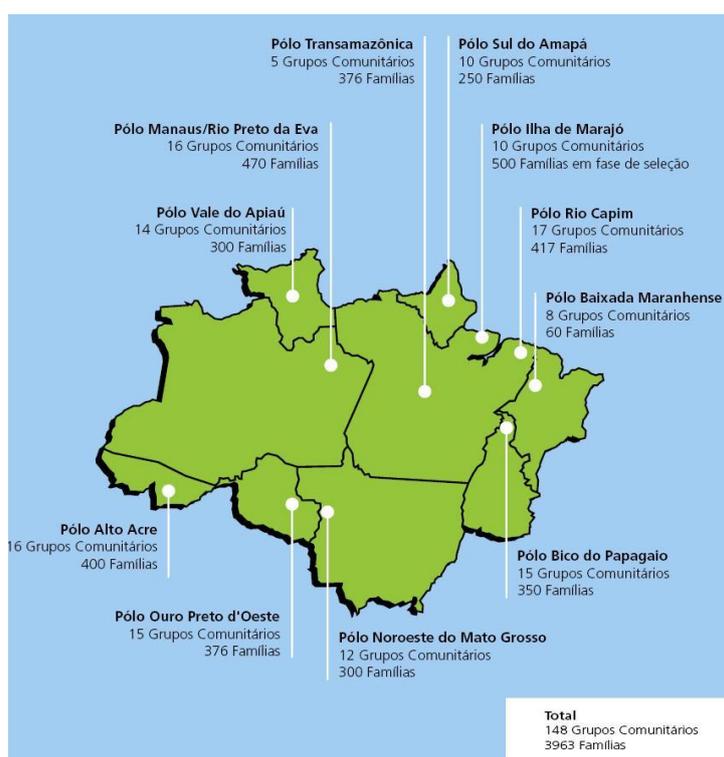


Figure 24: Location of the pioneer poles

Source: <http://www.mma.gov.br/sitio/index.php?ido=conteudo.monta&idEstrutura=33&idConteudo=8086&idMenu=8581>.

The program was implemented initially in the states of Para and Amazonas, in two pilot regions in the rainforest (Inhetvin 2008). The ten most important sustainable ‘poles’⁴ in the Amazon were defined with input from the farmers and their organisations (Stachetti Rodrigues 2008). These **pioneer poles** (see Figure 24) were comprised of **producer associations and cooperatives** based on social, cultural, geographic and natural aspects (Bittencourt et al. 2008: 22), including an average of approximately 400 farmer families around each pole, with the smallest number being 60 and the largest 500

⁴ The pioneer poles are socio-environmental units within the organisational and spatial structure of Proambiente.

(Bittencourt et al. 2008: 25). One of the goals was the strengthening of existing social organisations (Bittencourt et al. 2008: 23). Social control and integrated administration between the federal government and civil society was secured through the **administrative councils of the pioneer poles (Conselhos Gestores dos Pólos)** (Bittencourt et al. 2008: 22).

A **Diagnostico Rápido Participativo (DRP) (quick participative diagnosis)** was conducted with the different local players (Bittencourt et al. 2008: 25) and a **Sustainable Development Plan (Plano de Desenvolvimento Sustentável)** defined for the pioneer poles (Bittencourt et al. 2008: 23). The Sustainable Development Plan addresses aspects such as the integration, improvement and commercialisation of the pioneer pole's production (Bittencourt et al. 2008: 23) and defines objectives and measures for the sustainable development of the pole and the creation of **community groups** (Bittencourt et al. 2008: 25).

Technical assistance granted to pole families and **community agreements** were developed by community groups through a process of collective commitment (Bittencourt et al. 2008: 25).

Management Plans were developed for the **Productive Family Units (Planos de Utilização das Unidades de Produção PU)** as integrated planning tools for the use and conservation of natural resources in the productive area (Bittencourt et al. 2008: 25). These define the objectives for, and critical aspects of, the land use conversion, the spatial and temporal use of natural resources and the definition of Production Areas, Permanent Preservation Areas and Legal Reserves (Bittencourt et al. 2008: 23).

The PU may include provisions that relate to land use change (reduction of the use of fire, recovery of degraded areas etc.), recovery of protected areas (Legal Reserves, Permanent Preservation Areas) and an analysis of the productive unit (Bittencourt et al. 2008). The PU has three main objectives:

- To define planning for family productive units with respect to land use change,
- To provide the basis for rural credit projects and
- To develop the conditions that can enable the certification of environmental services (Bittencourt et al. 2008: 26).

A participatory certification system was devised under the name **Eco-Cert.Proambiente** as an integral part of the Proambiente Program (Bittencourt et al. 2008: 28). This **socio-environmental certification** aimed to demonstrate how families followed the Proambiente principles and provided environmental services (Bittencourt et al. 2008: 27). The system comprises national and international agreements with respect to reducing deforestation, improving carbon sequestration, reinstating hydrological functions of ecosystems, conserving biodiversity and other aspects (Bittencourt et al. 2008: 23). It is organised in **two steps**:

- 1) The families certify each other via the community agreements (**participative certification**) and
- 2) An independent certification institution is contracted to undertake field audits (**external certification**) (Bittencourt et al. 2008: 27).

Through certification for environmental services the families receive **compensation** for the environmental services that they have provided (Bittencourt et al. 2008: 27) based on four principles: productive efficiency, environmental quality, health, and management and administration (Bittencourt et al. 2008: 31). These principles consist of 28 criteria in two categories: environmental services and conformity with Proambiente principles (Bittencourt et al. 2008: 28) and related indicators, including proxies for the maintenance of biodiversity (Bittencourt et al. 2008: 31). These are evaluated through the verification of the effectiveness of the PUs (Bittencourt et al. 2008: 35), interviews with the farmers, field surveys and other analysis and interpretation. This gives rise to information on alternative forms

of maintenance and techniques that minimise the negative impacts and maximise the generation of environmental services (Bittencourt et al. 2008: 36).

Even though the program encountered a number of difficulties (for example, the issue of how best to transfer money to the farmers) (Inhetvin 2008), it was successfully implemented. Nationwide implementation was planned for 2002, but eventually put on hold (Inhetvin 2008).

6.2.9 Project case study: Promata

The **Atlantic Forest Protection Project of Minas Gerais (Promata)** was launched in 2003 as part of the Pilot Program to Conserve the Brazilian Rainforests (PPG7). It is under the responsibility of the State Secretary of the Environment and Sustainable Development (**SEMAD**) and includes 429 municipalities, which comprise in total approximately 25% of the state of Minas Gerais (140,000 km²) (Promata MG n.d.: n. pag.). Against a background of the advanced state of destruction of the Atlantic Forest, the goal was to “contribute to the protection of the remnants of the Atlantic Forest in Minas Gerais and to recover their areas of degradation” (Grossi and Inhetvin 2009: n. pag.). While Promata focused on forest fragments in conservation units, it also considered the surrounding areas, with the goal of promoting the protection, recovery and sustainable use of the Atlantic Forest remnants and reconnecting remaining areas and programmes (Promata MG n.d.: n. pag.).

The project made strategic investments in the following key areas:

- Infrastructure, equipment and vehicle related work,
- Instruments, techniques and strategic tools,
- Development of modern and effective environmental protection,
- Training of professionals and
- Information systems, control and integrated management (SEMAD et al. 2008: 7).

The goal is underpinned by two objectives: first to create the conditions for the sustainable protection of the Protected Areas covered by the project and second to promote the first steps towards sustainable planning and land use in the region (Grossi and Inhetvin 2009: n. pag.). These objectives are implemented in five operational components:

- I Fortifying Protected Areas,
- II Monitoring, control and supervision,
- III Preventing and fighting forest fires,
- IV Sustainable development in the areas surrounding the Protected Areas and the corridors connecting them and
- V Project administration, monitoring, and evaluation (Grossi and Inhetvin 2009: n. pag.).

Component I focuses on the development and support of new instruments to provide more modern management alternatives for Protected Areas (Grossi and Inhetvin 2009: n. pag.). Two strategies are employed. The first enforces the construction and renovation of existing infrastructure, protection and public use of Conservation Units. The second develops administrative tools and methods (Grossi and Inhetvin 2009: n. pag.). The resulting administration has improved notably in Protected Areas (Promata MG n.d.: n. pag.).

Component II recognises continuous monitoring as the most relevant instrument for planning and executing the activities of the **State Forestry Institute (IEF)** (Promata MG n.d.: n. pag.). It includes a

Monitoring Subcomponent and a **Control and Supervision Subcomponent**. It focuses on technical and financial resources for planning, monitoring and evaluating activities for the protection and supervision of natural resources and sustainable forest development. Furthermore it strives to “fortify supervision in high-priority areas and provide technical support for establishing a policy for integrated and harmonised control and supervision among the various institutions involved” (Grossi and Inhetvin 2009: n. pag.). Thus, the coverage of the Atlantic Forest biome in the state of Minas Gerais has been mapped systematically on a semi-annual basis since 2006 (Grossi and Inhetvin 2009: n. pag.). Between 2004 and 2007 nearly 42,000 audits and licensing checks were conducted to control the exploitation, transport and consumption of natural forest products. Assessments of the impact on the natural environment were also undertaken (Promata MG n.d.: n. pag.). This led to an increase in materials and improved techniques among the professionals working in the Conservation Units and in other IEF local units (Promata MG n.d.: n. pag.).

Component IV aims to promote sustainable development by encouraging forest growth. This is done by assisting the reinstatement and regeneration of degraded areas surrounding the Conservation Units with native species, with the goal of reconnecting forest fragments (Promata MG n.d.: n. pag.). The concept of **ecological corridors** is favoured (Promata MG n.d.: n. pag.). A technical study was undertaken to identify and prioritise the areas with the highest potential for connectivity (Promata MG n.d.: n. pag.). On the ground, new forest growth was encouraged by IEF field technicians, who distributed sprouts, goods and financial support to growers receiving grants (Promata MG n.d.: n. pag.).

Several consultants analysed the economic alternatives for the sustainable use of natural resources, in order to reduce the current pressure on Atlantic Forest remnants (Grossi and Inhetvin 2009: n. pag.).

With the goal of encouraging preservation on the property of rural landowners, Promata instituted an **incentive programme**. Besides the usual inputs and goods normally provided by the IEF, owners also received **payments for environmental services**. These funds compensated them for services rendered in recovery preservation and permanent conservation areas on their properties (Grossi and Inhetvin 2009: n. pag.). Partnerships were established with council governments and non-governmental organizations (Ambiente Brasil and Amanhagua), which contributed their own financial resources and technical personnel in addition to those provided by IEF, with the goal of expanding reinstatement and regeneration of 5,000 ha of degraded areas in small and average-sized rural properties surrounding the Conservation Units (Promata MG n.d.: n. pag.; Grossi and Inhetvin 2009: n. pag.).

With respect to compensation, based on the legal provisions Promata contributed to the improved implementation of the SNUC Law. Most notably this was realised through the creation of the **Núcleo de Compensação Ambiental (NCA)** within the IEF (Grossi and Inhetvin 2009: n. pag.). This **Environmental Matching Funds Center** has the objective of identifying, categorising and allotting resources as a specific means of fortifying, creating and expanding protected areas under the SNUC Law (Grossi and Inhetvin 2009: n. pag.). Seven consultants (three from the IEF and four from UNESCO) work in the NCA to reach this objective and to facilitate the proper implementation of the law (Inhetvin 2008). The NCA has thus made it possible to permanently consolidate the administrative instruments for matching environmental funds, as provided by law, and for the entire state (Grossi and Inhetvin 2009: n. pag.).

An innovative experiment in financing the recovery of the Atlantic Forest has been started with the goal of creating a bio-corridor between State Park Brigadeiro and National Park Caparaó. The approach adopted involves **carbon sequestration** (Clean Development Mechanism – CDM) and relies on the planting of native species in areas of protection and production (Grossi and Inhetvin 2009: n. pag.). The goal is the reforestation of 120,000 ha in Minas Gerais, maximising the number of carbon sinks (Inhetvin 2008). The **carbon credits** will be sold to KfW for a duration of thirty years, with the

credits being measured and paid every five years (Inhetvin 2008). This aims to help mitigate global climate changes and is the starting point for other possible CDM projects (Grossi and Inhetvin 2009: n. pag.)

The project was implemented by the IEF under the supervision of SEMAD (Promata MG n.d.: n. pag.). An Executive Coordinating Group (GEC) planned, monitored and evaluated all activities. From the outset, the project was embedded in the existing administrative structure of IEF (Grossi and Inhetvin 2009: n. pag.). This strategy contributed significantly to the project's success.

Promata also sought to involve other institutions at local, regional and national levels:

- Brazilian National Environmental Protection Agency (IBAMA),
- The Military Police of Minas Gerais (PMMG), through the Environmental Police and the Firefighters Corps of Minas Gerais,
- Universities,
- NGOs (Fundação Biodiversitas, Ambiente Brasil, Valor Natural, Terra Brasilis, Instituto Terra and Amanhagua),
- Council governments,
- Private firms,
- Public institutions and
- International cooperation projects and programmes (Promata MG n.d.: n. pag.; Grossi and Inhetvin 2009: n. pag.).

Promata was a result of a financial partnership between Brazil and Germany, through the KfW Bankengruppe. The financing of the project (€15 million) was supported by the German Government and the State of Minas Gerais, through SEMAD and IEF (approximately half each) (Promata MG n.d.: n. pag.).

The project was completed in December 2007 (Grossi and Inhetvin 2009: n. pag.). It “reached all the expected results and can be concluded that it was effective and efficient in the application of its financial and human resources” (SEMAD et al. 2008: 7). Its results will form the strategic input for a second phase, which will “prioritize establishing strategic alliances and aspects of interdisciplinary cooperation in contexts of integrated environmental protection” (Grossi and Inhetvin 2009: n. pag.). Furthermore it will aim to:

- Consolidate the results of Phase I in the Protected Areas already covered by the Project,
- Expand activities into other Protected Areas,
- Continue to develop the methodology for the protection of the Atlantic Forest,
- Support local sustainable development in areas surrounding the Protected Areas and
- Expand the system of partnerships (Grossi and Inhetvin 2009: n. pag.).

6.2.10 Critical discussion

Even though Brazil has very **advanced politics and legislation**, including two mandatory compensation approaches and numerous projects that concern impact mitigation, the country faces a number of problems regarding biodiversity protection. The most serious one lies in **law enforcement** and the proper **implementation** of these approaches (Inhetvin 2008). This is due to the fact that Brazil is both

a huge country and a country of contrasts. There are big **differences between the states**. While some states in the south are well developed, the Amazon is still the “land of opportunities”, which causes land speculation and management hardships (Stachetti Rodrigues 2008). As the **Amazon is a huge and mostly inaccessible region**, identifying impacts on biodiversity is already failing.

Furthermore, due to the federal organisation of the country and the **division of powers between federal, state and municipal authorities**, addressing environmental concerns depends to a great degree on **policy decision makers**. For example, the governor of the Mato Grosso state is a farmer and therefore very much concerned with questions regarding environmental compensation. Yet, his successor might have another focus. Consequently, each state will develop its principles depending on who is in power and other circumstances (Stachetti Rodrigues 2008).

Moreover, different **lobbies** have an influence on environmental politics. Regarding Legal Forest Reserves there is a group of deputies with links to the rural development lobby who want to **downgrade the fixed minimum percentage of natural vegetation cover** in the Amazon from 80% to 50%. There is a political discussion between them on the one side and government agencies and NGOs on the other side, who argue that it is important to preserve these Legal Reserves (Stachetti Rodrigues 2008).

With the respect to the project developers' offset, a similar discussion is ongoing regarding the appropriateness of a compensation ratio. Earlier this year, the Supreme Court decided that, based on a claim by some national industries, the obligation to pay a fixed minimum amount of 0.5 % of the investment is illegal (Fonseca 2008). Currently, the situation remains unclear until the Supreme Court will pronounce a final decision, which will probably result in the Brazilian government changing decree no. 4340/2002 and regulating how the amount of offsets will be calculated (Fonseca 2008). Thus, the compensation ratio is an important issue that requires work, with due consideration that some projects (e.g. mining) have **relatively low costs compared to the typically high environmental impact** (Darwin Alonso 2006: n. pag.).

For compensation payments, a problem arises with the destination of the money. Usually, compensation is paid, but it remains doubtful whether this benefits the environment. An example from there state of Minas Gerais relates to a mining company asphaltting a road as environmental compensation (Inhetvin 2008).

The **destination of the compensation payments** is a general point of criticism aimed at the project developers' offset. To ensure the implementation of the “no net loss principle”, compensation must aim to improve environmental quality, in order to counterbalance impacts. **Mere conservation actions** cannot reach this goal. Furthermore, compensation payments are made to the National System of Conservation Units, thereby introducing the risk that payments will go to support work that should be undertaken anyway by public authorities (i.e. there is a risk that there is no additionality)..

The fact that developers are not obliged to be directly involved in conservation and compensation measures may give the wrong impression that **mere payments** can resolve environmental obligations, with no need to commit business to environmental initiatives (Escorcio Bezerra 2007: 44f).

Another weakness of the Brazilian compensation approaches is that compensation measures are designed on a **case-by-case basis** (Fonseca 2008) and that **no general predefined comparable and transparent criteria** are available.

As the project developers' offset is linked to the environmental licensing system, compensation is only carried out for **major engineering projects and programmes** (Stachetti Rodrigues 2008). Thus, a large number of impacts are not covered by mandatory compensation approaches.

Furthermore, no provisions are made with respect to environmental compensation for impacts of **existing facilities**, but these may generate significant environmental damage and biodiversity loss.

The role of **private reserves** is still weak. Even though the government favours their creation by means of tax incentives, only a few private owners have actually created private reserves (Brandão 2008).

6.3 Selected aspects of Impact Mitigation Regulation in Egypt

6.3.1 Scope and objectives

While there has been nature conservation legislation in Egypt since the 1920s, biodiversity is still considered in only a few laws, the most important of which are **Law 102/1983 for the Natural Protectorates** and **Law 4/1994 for the Environment** (Government of Egypt; United Nations Development Programme n.d.: 8). In this context, the country's activities in the field of biodiversity strongly focus on conservation issues. Thus, the establishment of **Protected Areas** plays an important role (EEAA 2002: 21). Moreover, the **nature conservation sector** at the Egyptian Ministry of Environmental Affairs shall seek for compliance with the CBD through follow up and monitoring (Government of Egypt; United Nations Development Programme n.d.: 8).

In Egypt the most important reference to compensation issues is Law 4/1994 for the Environment, which defines compensation as "compensation for the damage resulting from pollution accidents in accordance with the application of the provisions of the **Civil Code** and the provisions of the International Convention on Civil Liability" (Ministry of State for Environmental Affairs 1994, Art. 1). With pollution being the central focus of this determination, the law defines thresholds (for example, for different pollutants). Furthermore the law refers specifically to environmental disasters. Art. 7 stipulates the establishment of an **Environmental Protection Fund** to tackle this issue (see Chapter 6.3.7).

Law No. 4 of 1994 for the Environment also considers impacts due to development projects (and thus, compensation issues within the mitigation hierarchy in the context of EIA). It states that new establishments or projects as well as expansions of existing establishments must be subject to an **Environmental Impact Assessment** (EIA) before a permit is issued (EEAA; Entec UK Ltd 2005a: 3). In 1994 the responsible body at the Ministry of State for Environmental Affairs, the **Egyptian Environmental Affairs Agency** (EEAA) launched a **Programme of Support for Environmental Assessment and Management** (SEAM)⁵. Capacity building in EIA is being achieved through the implementation of EIA projects, the preparation of **EIA Guidance Notes** to assist local consultants in preparing EIA reports and training workshops (EEAA n.d.c, n. pag.). The EEAA issued a number of **sectoral guidelines** for specific development projects and **environmental screening forms**. These guidelines include:

- Oil and gas sector,
- Urban development,
- Ports, harbours and marinas,
- Cement manufacturing plants,
- Waste water treatment works,
- Industrial estates development,
- Land reclamation projects and

⁵ Support for Environmental Assessment and Management (SEAM) is a major environmental programme implemented by the Egyptian Environmental Affairs Agency, Entec UK Ltd and ERM with support from the UK Department for International Development.

- Pharmaceutical plants.

The objectives of the EEAA are summarised in Table 8.

Table 8: Objectives of the EEAA

Source: after Egyptian Environmental Affairs Agency. Available at:

<http://www.eeaa.gov.eg/English/main/objectives.asp>. Accessed: 18.10.2008.

<p>Strategic Objective:</p> <p>To introduce and integrate environmental dimensions in all national policies, plans, programmes relevant to protection of human health and management of natural resources.</p>
<p>Medium-Term Objective:</p> <p>To preserve the natural resource base, national heritage and biodiversity within a context of sustainable development.</p>
<p>Short-Term Objective:</p> <p>To reduce current pollution levels and thereby minimize health hazards and improve quality of life.</p>

6.3.2 Components of biodiversity and natural resources covered / measured

The **National Report** states that the assessment of potential biodiversity indicators is underway (EEAA 2002: 15). Further, the **National Biodiversity Strategy and Action Plan** of course refers to the components of biodiversity as laid down in the CBD, including species diversity, covering all hierarchical taxonomic levels of plants, animals and micro-organisms, habitat diversity and genetic diversity in species of plants, animals and microorganisms (Secretariat of the Convention on Biological Diversity 1998: 15). The **Egypt State of the Environment Report** goes along with this definition stating that “biodiversity encompasses natural environments and habitats as well as flora, fauna and microbial species and the genetic resources included in each” (Ministry of State for Environmental Affairs 2007: 102).

In the context of EIA, the sectoral guidelines noted above (see Chapter 6.3.1) claim to consider flora and fauna issues. Specifically this relates to the terrestrial and / or aquatic flora and fauna or their habitats, both on site and in the surrounding area, which are likely to be affected directly or indirectly during construction or operation of the project (EEAA 2005e: 10; EEAA; Entec UK Ltd 2005b: 11; EEAA 2005a: 8; EEAA 2005b: 27 and others).

These species and their habitats are assessed according to their importance in terms of international, national, regional or local importance (Land Reclamation Projects, EEAA 2005e: 10; EEAA 2005c: 11). The value of flora and fauna may reflect rarity, economic value and attractiveness (EEAA 2005a: 8). Therefore special emphasis is laid on:

- Threatened, protected or rare species, populations or habitats,
- Areas or communities protected by law 102/1983 and successive laws,
- The economic significance of any potentially affected species (e.g. for agriculture, aquaculture), and
- The scenic importance (EEAA 2005e: 10; EEAA 2005b: 27; EEAA 2005c: 11).

The draft proposal for an Environmental Screening Form as prepared by the SEAM Programme claims to include in the baseline information a description of protected areas if affected and a description of fragile or sensitive ecosystems that are present: "The applicant should mention if the project site is in the vicinity of any sensitive ecological areas, i.e. the Nile banks and its two branches and long canals, sea or lake shores or nature reserves and give a short description. Designated site descriptions should be given" (EEAA n.d.b: 7).

The **EIA Guidelines for Industrial Estates Development** assemble both environmental and social components by proposing a "Checklist of People and Environmental Resources Potentially Sensitive to Impacts from Industrial Estates Development" and another "Checklist of Environmental Impacts for Industrial Development" (see Table 9).

Table 9: Checklists to identify issues through environmental appraisal

Source: after EEAA; Entec UK Ltd 2005a: 3f

Checklist of People and Environmental Resources Potentially Sensitive to Impacts from Industrial Development	Checklist of Environmental Impacts for Industrial Development
<ul style="list-style-type: none"> • People living or working next to the industrial development or on roads leading to or from the development. • People living within the labour catchment of the industrial development. • People in areas of sensitive land uses, e.g. schools, in the local area which may be affected by the industrial development. • Environmental resources on, over or under land taken by the industrial development including wildlife habitats, land in other uses notably agriculture, attractive landscape features, aquifers, surface water bodies, rivers, canals, antiquities, etc. • Environmental resources near the industrial development including wildlife habitats, land in other uses notably agriculture, attractive landscape features, aquifers, surface water bodies, rivers, canals, antiquities, etc. • Flora and fauna both on the site and nearby. 	<ul style="list-style-type: none"> • Landtake for the development. • Impacts during construction works and as a result of built development, e.g. on landscape character and views. • Economic impacts both during construction and operation. • Noise during operation of the industrial development. • Emissions to the atmosphere and water resources during operation of the industrial development including dust or particulates, gases and liquid wastes, particularly those of a toxic or otherwise harmful nature. • Solid wastes from the operation of the industries deposited on land, particularly those of a toxic or otherwise harmful nature. • Traffic to and from the industrial development. • Impacts on existing utilities. • Hazards from the presence of explosive, flammable or toxic substances within the industrial development.

6.3.3 Methods for valuation and quantification of potential impacts

As noted above, EIA is the most commonly used instrument in Egypt for addressing compensation issues. Biodiversity is being considered in many EIAs reviewed by the EEAA. However the use of biodiversity considerations as an incentive measure is still limited (EEAA 2002: 40f). With about 12,000 EIAs conducted annually, EIA is an important environmental management tool in Egypt. Even though the inclusion of biodiversity issues is considered of relatively high importance, economic development objectives take priority in some cases (EEAA 2002: 45).

Nevertheless, efforts are being made to include the loss of biological diversity and interrelated socio-economic, cultural and human-health aspects when carrying out EIAs (EEAA 2002: 48). Economic and social issues are considered in the assessment process, for example local employment conditions that

may be affected or the existence of sites of particular social or cultural importance (e.g. **Guidelines for Land Reclamation Projects**, EEAA 2005e: 9). In the case of a planned industrial development, impacts on the local economy will generally occur, possibly leading to social change in areas which mainly depend on agriculture and other primary sectors (EEAA 2005a: 9f). Therefore the **EIA Guidelines for Pharmaceutical Plants** aim to take into consideration the “general economic context including employment levels, existing industries in the local area, other proposed developments [and the] general social context including educational levels in the local population, participation in formal economic activities” (EEAA 2005a: 9f).

Besides the EIA, **Environmental and Social Impact Assessments** are being undertaken, for instance the “**Environmental and Social Impact Assessment Framework for Greater Cairo Natural Gas Connections Projects**” (Egyptian Natural Gas Holding Company 2007).

The EIA process in Egypt is specified by the respective articles in Law 4/1994 for the Environment (EEAA 2002: 49). A list approach screens projects into three categories based on the different levels of EIA required (based on the severity of possible environmental impacts (EEAA 2005a: 4):

- For white list (A-category) projects the developer fills out an Environmental Screening Form (A). The competent administrative authority sends the form to the EEAA to be reviewed and evaluated within the legal period; otherwise the EIA report is considered accepted.
- For grey list (B-category) projects the developer requests an Environmental Screening Form (B) to be completed by the Governorate or EEAA.
- For black list (C-category) projects a full EIA is required following the Guidelines (EEAA 2005b: 4).

Identifying Issues through Environmental Appraisal

First, the key environmental issues likely to arise as a consequence of the development have to be identified. Data collection and surveys are undertaken to establish the environmental baseline. Generally the distribution of flora and fauna is presented as habitat or species location maps, shown relative to the position of the proposed works (EEAA 2005c: 11; EEAA 2005e: 10). The use of matrices is considered very helpful in coordinating and summarising information gathered in this preliminary environmental appraisal. A simple matrix as shown in Table 10 links people and resources on one axis with the potential impacts on the other (EEAA 2005a: 11; EEAA; Entec UK Ltd 2005a: 3).

Table 10: Example of an impact appraisal matrix

Source: after EEAA; Entec UK Ltd 2005a: 3

	Jobs	Noise and Air Emissions	Solid and Liquid Waste	Landtake
Local People	+	-	-	-
Wildlife Habitats	0	0	-	-
Agricultural Land	-	0	-	-
Land in other Uses	+	-	-	-
Landscape Features	0	0	-	-
Air Quality	0	-		
Surface Water	0	0	-	-
Aquifers	0	0	-	0
+ indicates a positive impact, - a negative impact, 0 is no noticeable impact				

6.3.4 Determining significance and thresholds

In assessing environmental impacts and determining their significance, it is first necessary to identify who or what is affected, then to describe how they are affected and finally evaluate these effects against a set of consistent assessment criteria (EEAA 2005a: 11).

Impacts should be either quantified, or fully described if not quantifiable (EEAA 2005e: 6). Each impact identified must be classified in terms of the severity of its effect on the environment (e.g. high impact, moderate impact, low impact, insignificant impact) (EEAA; Entec UK Ltd 2005b: 13). The applied criteria for evaluating the significance of impacts and their effects must be clearly defined and should be set in advance. Where possible, legislative standards or international standards (e.g. WHO, US EPA, etc.) should be followed (EEAA 2005a: 11; EEAA 2005e: 6). In all cases the choice of the appropriate standard must be robust, defensible and relevant to the local situation. If no suitable existing standard is available, then the criteria developed and used must be clearly explained in the EIA (EEAA 2005a: 11). Evaluation of significance of impacts should take account of:

- Magnitude: the scale of the impact,
- Duration: the duration of the impact,
- Extent: how widely spread the impact is,
- Reversibility: whether the impact is temporary, reversible or permanent,
- Directness: whether the impact is direct or indirect,
- Timing: short term or long term,
- Both beneficial and adverse effects and
- Public interest and political echo of the impact (EEAA 2005d: 9; EEAA 2005e: 6; EEAA; Entec UK Ltd 2005a: 7).

Additionally cumulative impacts related to existing or past projects in the same location or the immediate proximity; other forms of industry in the vicinity which may have similar impacts and the advantages or disadvantages of clustering activities in the area have to be taken into account (EEAA; Entec UK Ltd 2005b: 11).

6.3.5 Mitigation hierarchy

The Egyptian National Report (2002) states that the inclusion of development alternatives and mitigation measures and the elaboration of compensation measures are only required to a limited extent (EEAA 2002: 48). Nevertheless, several EIA Guidelines refer to the mitigation hierarchy. Mitigation should be an iterative process (EEAA 2005e: 6) identifying mitigation measures at three levels:

- **Avoidance** of the expected side effects before they are in place,
- **Minimisation** of their impact and
- **Mitigation** of the effects that could not be avoided or minimised (compensation) (EEAA 2005d: 9; EEAA 2005a: 5).

The **mitigation strategy** includes the consideration of alternatives, which is pointed out as an important step during the impact assessment (EEAA 2005d: 7; EEAA; Entec UK Ltd 2005b: 6; EEAA 2005e: 7; EEAA; Entec UK Ltd 2005a: 4; EEAA 2005a: 10). All EIAs should consider the alternatives that are

available to the proposed development. **Alternatives** that minimise environmental impacts should be identified and evaluated. The costs and benefits for both people and the natural environment throughout the whole life cycle of the proposal shall be taken into account in order to lessen community concerns and reduce the costs of mitigation and management required to reduce environmental impacts. Finally, the selection of the preferred alternative must be based on financial and economic sustainability and other considerations as well as environmental criteria (EEAA; Entec UK Ltd 2005a: 4, 1010024: 7). Early appraisal of alternatives is essential, preferably from the start of planning the project including the following considerations:

- No project, the “no development” alternative,
- Alternative locations for the project to obtain maximum profit from the economical, planning and environmental points of views,
- Different scales for the project and the flexibility of its size,
- Different alternatives for land use to reach the ultimate environmental performance,
- Different alternatives for the construction process: e.g. day or night to avoid noises,
- Alternative management or operational practices, and
- Mitigation and rehabilitation options (EEAA 2005d: 7).

The mitigation strategy should set out the environmental management principles to be followed in the planning, design, establishment and operation of the proposed development. It should include specific locational, layout, design or technology features and an outline of ongoing management and monitoring plans (EEAA 2005f: 21; EEAA 2005a: 20, EEAA; Entec UK Ltd 2005a: 7, 16).

The evaluation of the strategy must be undertaken both in relation to individual impacts and collectively for all impacts and has to take into account its sustainability, integration, feasibility, and compliance with statutory obligations under other licences or approvals (EEAA 2005a: 20; EEAA 2005e: 6, 13; EEAA 2005c: 6, 13; Entec UK Ltd 2005a: 7). The mitigation strategy has to assure that for each adverse impact that is identified, a mitigation measure is identified which will reduce the impact to an acceptable level (EEAA; Entec UK Ltd 2005b: 15). It may also include any enhancement measures to amplify any positive impacts of the development (EEAA 2005e: 13).

The severity of the residual impacts must also be defined. They should be subject to monitoring in the form of an **environmental management plan** (EMP) in order to determine the effectiveness of each mitigation measure (EEAA; Entec UK Ltd 2005b: 15; EEAA 2005c: 6 EEAA 2005e: 6).

6.3.6 Determining offset demand and compensation measures

There is no general methodology provided for determining environmental (biodiversity) compensation i.e. the type and ratio etc. Instead more or less specific mitigation measures are proposed as exemplars for each sector covered by the guidelines. Table 11 shows mitigation measures for the development of ports, harbours and marinas according to the respective guidelines.

Table 11: Mitigation measures proposed in the EIA Guidelines for ports, harbours and marinas

Source: after EEAA; Entec UK Ltd 2005b: 11ff

Mitigation measures and monitoring	
<p>Land surface issues</p> <p>Proposed mitigation and management measures to control impacts and to ensure compliance with relevant standards including an estimate of mitigation effectiveness; measures include:</p> <ol style="list-style-type: none"> stabilisation works for cuttings, embankments and open channels; erosion and sedimentation control structures; landscaping and revegetation proposals. <p>Maintenance programmes for all mitigation measures to ensure effective operation.</p> <p>The proposed monitoring to determine the effectiveness of mitigation and to verify predictions.</p> <p>Coastal Impacts</p> <p>Mitigation measures should be discussed in terms of changing the plan or the design. Monitoring should discuss location and intervals for surveying the shoreline, with the government body responsible for review.</p> <p>Fauna and Flora issues</p> <p>Landscaping proposals, including compensatory planting of indigenous species, details of proposed mitigation methods to protect indigenous species including the seed stock in topsoil stockpiles.</p> <p>Identifying potential weed and introduced species (including seaweeds), and describing measures to control and prevent infestations at the site and to control spread into localities adjacent to the proposal.</p> <p>Mitigation proposals such as compensatory restocking of indigenous species, provision of new appropriate habitat, opportunities for colonization, considered timing of major disturbances.</p> <p>Identifying potential vermin, feral and introduced species (including those from ballast water); measures to control and prevent infestations at the site and to control spread into localities adjacent to the proposal.</p> <p>The proposed monitoring to determine the effectiveness of mitigation and to verify predictions</p> <p>Hazardous Waste</p> <p>Proposed mitigation and management measures to control impacts and to ensure compliance with relevant standards, including an estimate of how effective this mitigation is expected to be and consequences of failure, fire walls, segregation of chemicals, fire fighting systems, use of inflammable materials.</p> <p>Heritage issues</p> <p>Propose measures to mitigate impacts to conserve items of heritage significance - if items of significance are to be disturbed a conservation management plan may need to be prepared in consultation with the government officials. Consider the acceptability of impacts on heritage significance and assess the adequacy of the measures to mitigate impacts during all stages of the proposal.</p> <p>Air quality and Noise</p> <p>Proposed measures to enhance air quality and to reduce noise.</p>	<p>Hydrological issues</p> <p>The provisions of any relevant water body management plans.</p> <p>Proposed mitigation and management measures to control impacts including an estimate of mitigation effectiveness.</p> <p>Proposed monitoring to determine the effectiveness of mitigation and to verify predictions.</p> <p>Water quality and waste management issues</p> <p>Proposed mitigation and management measures to control impacts and to ensure compliance with relevant standards including an estimate of mitigation effectiveness; measures include:</p> <ol style="list-style-type: none"> drainage, storm water, wastewater and emergency management systems; such as: <ol style="list-style-type: none"> provision of reception facility; pump out and collection facilities (indicate proximity to any water supply take-off); sediment controls such as sediment traps and silt curtains; gross pollutant traps and trash racks, oil separators, grease traps, drip trays, filters, control of build-up of debris in the vicinity of the port; controls to compensate for poor flushing; controls to prevent contamination of water from maintenance, repair activities or from accidental leakage or spillage of potentially harmful substances; response strategies, containment and recovery facilities including location of materials used in response strategies. procedures for storage, transport and disposal of waste for all hazardous and dangerous materials used on land and water; details of solid and liquid waste storage and disposal facilities; the impact of treatment methods on receiving water or soil; the vulnerability of hazardous and waste storage and treatment facilities to flooding or rising water tables; maintenance programmes for all mitigation measures to ensure effective operation. <p>The proposed monitoring to determine the effectiveness of mitigation and to verify predictions.</p> <p>An assessment of the need for a waterway or bay management plan.</p> <p>Visual issues</p> <p>Proposed methods of reducing visual impacts such as landscaping, materials selection and management measures.</p> <p>Cumulative impacts</p> <p>The compatibility of mitigation measures and the compatibility with existing (or proposed) water body management plans or flood mitigation works.</p>

Even though biodiversity is impacted by several issues (e.g. water quality) mitigation measures for flora and fauna are explicitly indicated. These include:

- Compensatory planting or restocking of indigenous species,
- Provision of new appropriate habitat,
- Opportunities for colonisation,
- Careful timing of major disturbances and
- Measures to control and prevent infestations at the site and to control spread into adjacent localities (EEAA 2005a: 21; EEAA; Entec UK Ltd 2005a: 16; EEAA 2005f: 22).

The application of the **ecosystem approach** is being favoured (EEAA 2002: 66).

6.3.7 Implementation and responsibilities / costs

Article 7 of Law 4 for the Environment requires the establishment of an Environment Protection Fund within the Egyptian Environmental Affairs Agency (EEAA), being comprised of:

- Amounts allocated in the state budget to subsidize the fund,
- Grants and donations presented by national and foreign organisations for the purpose of protecting and promoting the environment and which are accepted by the Board of Directors of the EEAA,
- **Fines levied and damages awarded or agreed upon for any harm caused to the environment,**
- The financial resources of the Nature Reserves Fund provided for in Law 102 of 1983,
- The proceeds of duties imposed on travel tickets: the EEAA share 25% of duties on tickets issued in Egypt in Egyptian currency, pursuant to Article 1 of Law 5 of 1986 and to the Prime Minister's Decree no. 697 of 1986, to a minimum of 12.5% of the total proceeds of the abovementioned duties⁶,
- The returns from experimental projects undertaken by the EEAA,
- Amounts collected by the EEAA for services rendered to third parties,
- Fees for licenses issued by the EEAA, and
- **Amounts collected on a temporary basis on account of fines and compensation for damage caused to the environment, which are deposited in the Fund and held in trust** (Ministry of State for Environmental Affairs 1994: 13).

The resources of this fund are then to be used for fulfilling the objectives and tasks of the EEAA, including dealing with environmental disasters and pollution from unknown sources, the establishment, operation and administration of **Environmental Monitoring Networks and Nature Reserves** and to participate in financing environmental protection projects undertaken by local administrative agencies and grass-roots organisations which are partly financed through popular participation (Ministry of State for Environmental Affairs 1994: 14).

⁶ After the enactment of Law 102 in 1983, Law 101 was enacted in 1985 to secure a suitable source of funding for the protected areas by levying an additional tax on aeroplane tickets, with the income used to finance programmes for developing tourism and environmental protection (Secretariat of the Convention on Biological Diversity 1998: 15).

To ensure the implementation of the measures formulated during the EIA, an EMP has to be set up that should include a carefully designed monitoring plan that is related to the predictions made in the EIA and the key environmental indicators (EEAA 2005a: 21; EEAA; Entec UK Ltd 2005a: 16).

6.3.8 Project case study in the Egyptian petroleum sector: Environmental Accounting as a concept for balancing environmental liabilities and assets

Dr. Mohammad Raouf Abdul-Hamid Aly, senior researcher on environmental issues at the Gulf Research Center and the Secretary-General of the Egyptian Forum on Environment and Sustainable Development presented for the Ninth Annual Conference of the Economic Research Forum (ERF)⁷ 2002 a **theoretical framework for Environmental Accounting** and its application in the Egyptian Petroleum Sector.

In Egypt the petroleum industry was first operated by multinational companies. These companies are aware of implementing **Environmental Management Systems** (EMS) and thus, the Egyptian petroleum sector takes a pioneer role with respect to environmental issues (Raouf 2002: 14). **Environmental Liabilities** play an important role in the petroleum sector (Raouf 2002: 22).

The concept of Environmental Accounting allows for the fact that any business has a number of secondary (environmental and social) outputs (e.g. pollution) alongside its main outputs and therefore has to incur costs to mitigate or prevent them in order to avoid a third party in society or society as a whole having to bear the cost of them (**externalities**) (Raouf 2002: 4).

Accounting can play an instrumental role in highlighting the environmental responsibilities of different entities (e.g. commercial and industrial businesses) (Raouf 2002: 3). In this context it balances environmental liabilities and assets, striving to avoid or internalise environmental and social externalities. Table 12 shows an **Adjusted Balance Sheet** as proposed by Dr. Aly.

Environmental assets are possessed by an organisation as a result of environmental protection, regulations or voluntary activities relating to the environment. Environmental liabilities are defined as “a present obligation to make an expenditure or to provide a product or service in the future” (Raouf 2002: 11). Even though it is difficult to classify environmental liabilities, a distinction can be made between **compliance obligations, remediation obligations, fines and penalties** and **compensation obligations**, whereby the latter usually refers to compensation for “damages suffered by individuals, their property, and businesses due to use or release of toxic substances or other pollutants. These liabilities may occur even if a company is in compliance with all applicable environmental standards [...] Compensation liabilities may involve costs for remediation of contaminated property as well as provision of alternate water supplies, thus somewhat overlapping the remediation category” (Raouf 2002: 12). In contrast, **compensation payments for natural resource damages** to date have been relatively small. These natural resource damages relate to “injury, destruction, loss, or loss of use of natural resources that do not constitute private property. Rather, the resources must belong to or be controlled by federal, state, local, foreign, or tribal governments. Such resources include flora, fauna, land, air, and water resources” (Raouf 2002: 9ff).

⁷ The Economic Research Forum (ERF) is a regional network dedicated to promoting high quality concept economic research to contribute to sustainable development in the Arab countries, Iran and Turkey.

Table 12: Adjusted Balance Sheet

Source: slightly modified, adapted from Raouf 2002: 18

Assets	Liabilities
First: Environmental and natural (ecological) assets <ul style="list-style-type: none"> • Natural assets • Non-renewable resources reserves • Renewable resources reserves • Environmental assets • Environmental deposits • Environmental goodwill • Environmental performance bonds • Pollution bonds Second: Manmade assets	First: Current and potential (future) environmental liabilities <ul style="list-style-type: none"> • Compliance liabilities • Treatment liabilities • Remedial liabilities • Compensatory liabilities • Natural assets liabilities Second: Owner's equity and other liabilities <ul style="list-style-type: none"> • Owner's equity • Long-term liabilities • Short-term liabilities

Environmental accounting is concerned with achieving new goals such as measuring and evaluating the potential or actual environmental impacts of projects and organisations (Raouf 2002: 3). In this context, two approaches can be used either in isolation or simultaneously: the physical approach and the monetary approach. According to the **physical approach** the deterioration and gain of natural resources in comparison to its state and use (e.g. agriculture, desert land, etc.) are presented in physical terms, whereas the **monetary approach** quantifies these changes in amounts of money (Raouf 2002: 7).

The main objective of the case study is to introduce a simple model for environmental accounting into the Egyptian petroleum sector, which might then be extended in the future to other sectors. Therefore a number of basic principles have been formulated (Raouf 2002: 16):

- Some positive and / or negative environmental impacts cannot be estimated (e.g. lack of data).
- All avoided costs are benefits and vice-versa.
- A cause-effect relationship exists for each environmental impact.
- Conservative estimates based on the lower value of each environmental asset or impact are adopted.
- Scenarios are used where uncertainty exists (low, moderate, high).
- A zero pollution rate is impossible to reach, though there is a cost for achieving a balanced environmental situation.
- Valuing impacts and assets relates to the biosphere and man-made assets only, i.e. the socio-economic impacts are not taken into consideration.

Valuing impacts and assets is an important factor for management making decisions on environmental expenditure. There are several techniques suggested which can be used for this purpose (Raouf 2002: 21f):

- The Shadow Project Technique,

- The Opportunity Cost Technique,
- Accounting Fair Value of an Asset, and
- Marginal Revenue and Costs.

Environmental accounting is a suitable tool to measure, guide and control sustainable development. It brings together preventive and corrective means (including compensation) while strengthening precautionary policies which help to avoid negative impacts.

Nevertheless, the proposed Environmental Accounting system is still at a very early stage of discussion and no examples of the practical implementation have yet been identified.

6.3.9 Critical discussion

The **legal situation regarding impact mitigation is still weak**. Law 4/1994 for the Environment is the main legal text and principally refers to pollution. **Little is said regarding liability and responsibility**. Law 4/1994 for the Environment does not specifically refer to the “polluter pays principle”.

Conservation of biological diversity is a business owned by the state and thus a state responsibility (Bayoumi 2008). In this respect Art. 7 of Law 4/1994 for the Environment requires the establishment of an **Environment Protection Fund** within the Egyptian Environmental Affairs Agency (EEAA), which should be used to address environmental disasters and pollution from unknown sources and to participate in financing environmental protection projects (Ministry of State for Environmental Affairs 1994: 14). However, it could not be confirmed that this fund is actually in place or whether it is working effectively.

Despite this, in the field of EIA the responsible body at the Ministry for the Environment, the EEAA, is active in providing guidance, through the SEAM Programme and by issuing a considerable number of sectoral EIA guidelines. These provide a standardised general approach. Nevertheless **little is known about the actual implementation and tangible projects**. This may be the result of a general lack of information or a missing information exchange, but it is also possible that this information is only available in Arabic and thus not accessible considering the scope of this study.

Notwithstanding, in the 2002 Egyptian National Report it is stated that EIA is an important environmental management tool in Egypt and about 12,000 EIAs are conducted annually. However, it is not clear whether this refers to proper EIA reports according to the C-category or whether this refers to all kinds of EIA instruments, including Environmental Screening Forms of the A- and B-categories (see Chapter 6.3.3 above).

Additionally, **economic development objectives take priority in some instances**, even though the inclusion of biodiversity concerns in EIAs is considered to receive relatively high emphasis (EEAA 2002: 45). Another problem highlighted in the National Report is that **the inclusion of development alternatives and mitigation measures and the elaboration of compensation measures are only required to a limited extent** (EEAA 2002: 48).

The EEAA carries out **environmental inspections on industry** aiming to support and strengthen procedures to reduce the negative environmental impacts and thus implementing Law 4/1994 for the Environment. The environmental inspection entails numerous interrelated aspects, including planning, implementation and information. The concerned bodies within the EEAA carry out different types of inspection, including comprehensive (periodic) inspections and inspections in response to complaints. They follow the inspection methodology laid down in the General Environmental Inspection Procedures Manual (including various checklists and forms), which has been published by the Agency.

6.4 Selected aspects of Impact Mitigation Regulation in Madagascar

6.4.1 Scope and objectives

Because of its (endemic) species richness and the threats that they face, Madagascar is considered by environmental organisations to be a global biodiversity “hotspot” (QMM n.d.: 4). The Malagasy government became aware of the need to address this situation and in 1992 established the **Environmental Action Plan** (Plan d’Action Environnementale, PAE) (Andriambelo 2008). Later, in 2004 a **vision**, called “**Madagascar Naturally**” (**Durban Vision**), was launched, which in 2006 was translated into an operational programme in the **Madagascar Action Plan** (MAP) (Projet de Gouvernance des Ressources Minerales de Madagascar n.d.a: 1): “Madagascar will be a world leader in the development and implementation of environmental best-practice. After many decades of exploitation and neglect, we have begun to turn the tide. We will become a “green island” again. Our commitment is to care for, cherish and protect our extraordinary environment. The world looks to us to manage our biodiversity wisely and responsibly – and we will. Local communities will be active participants in environmental conservation under the guidance of bold national policies. Given the Government’s vision - Madagascar Naturally - we will develop industries around the environment such as eco-tourism, agribusiness, sustainable farming practices and industries based on organic and natural products. These industries and activities will minimize biodiversity damage and maximize benefits for the nation and the people” (Presidency of Madagascar 2006: 1). One of the challenges formulated in the MAP is to “develop the environmental reflex at all levels”. This includes the contribution of national, regional and local government in terms of environmental politics and **Environmental Impact Assessment** (EIA) and strengthening the framework for preventing environmental damage (including pollution) caused by business, miners, farmers, fishermen, and tourism (Presidency of Madagascar 2006: 7). The following priority actions were defined:

- Develop the Code of the Environment,
- Develop a policy for mining companies and logging companies for **biodiversity offsets** and other mechanisms and incentives for environmental protection,
- Promote the **compatibility of investment with the environment** (compatibilité des investissements avec l’environnement, MECIE) and the **environmental management system** (système de management environnemental, SME) in the sectors of mining, transportation, fishery, agriculture, tourism, industry etc.
- Promote **strategic environmental assessment** (évaluation environnementale stratégique, EES) (Presidency of Madagascar 2006: 8).

The most important legal references for biodiversity compensation issues are the **Malagasy Environmental Charter** (Loi no. 90-033 du 21 décembre 1990, portant Charte de l’Environnement malagasy) and the **Decree MECIE** (Mise en Compatibilité des Investissements avec l’Environnement) stipulating the obligation to carry out an EIA for public and private investment projects (Office National pour l’Environnement n.d.d: 5; Ministère de l’Environnement; Office National pour l’Environnement 2000: 7). Article 10 of the Environmental Charter states that an Environmental Impact Study (étude d’impact environnementale, EIE) will be undertaken for projects with the potential to cause adverse effects on the environment (Ministere de la Justice n.d.: 3). The respective Decree MECIE specifies the conditions, the procedure and the responsible parties. The operational tools of the decree are:

- **General Guidelines for the realization of an EIA** (directive générale pour la réalisation d’une étude d’impact sur l’environnement),

- **Sectoral EIA Guidelines** for tourism, roads, aquaculture, on- and off-shore oil, forests, textile, mining and
- **Guidelines for the adaptation of conformance of investment with the environment** (Guide de Mise en Conformité MEC) (Office National pour l'Environnement n.d.c: 2).

In 2000 the Ministry for the Environment, with technical assistance from the **Office National pour l'Environnement** (ONE), published the General Guidelines for the realization of an EIA. This is to be used when undertaking environmental impact studies together with the respective sectoral guide (Ministère de l'Environnement; Office National pour l'Environnement 2000:7).

The mining sector has a significant position, given that the MAP includes the goal of promoting biodiversity compensation mechanisms for this sector, as noted above. Furthermore the whole sector has undergone an EIA in 2003 (Tecsult International Limitée 2003). The mining sector also developed **Good Governance and Asset Management Principles** to improve environmental performance and management of national assets (see Figure 25) (Projet de Gouvernance des Ressources Minerales de Madagascar n.d.a: 1). A **policy of net gain** is promoted ("leaving better conditions than existed before the project began"), with the aim of replacing the historical approach of mining and hydrocarbon industries, when the implementation of mitigation policies meant restoring conditions to the state prior to the impact once a project had been completed (Projet de Gouvernance des Ressources Minerales de Madagascar n.d.a: 2).



Figure 25: Good governance principles presented by the mining sector in Madagascar

Source: Projet de Gouvernance des Ressources Minerales de Madagascar n.d.a: 1

Moreover, various industries (e.g. forestry and fisheries) are progressively adopting internationally recognised **certification systems** aimed at ensuring that their products are harvested sustainably and cause no harm to local people or the environment (PGRM Projet de Gouvernance des Ressources Minerales de Madagascar n.d.: 3). Again, in the mining sector the process of creating a certification system is underway (currently there is no international certification system for mining or hydrocarbons

in place). This will build on international standards such as the CSP-WRI Framework for Responsible Mining and ICMM principles, and on the results of the **Mining Certification Evaluation Project (MCEP)**, that appraised the feasibility of such a system (PGRM Projet de Gouvernance des Ressources Minerales de Madagascar n.d.: 3).

At a local level there are singular examples of introducing systems of payments for environmental services, established by NGOs, to pay villagers for the protection and enhancement of natural resources instead of their destruction (Andriambelo 2008).

6.4.2 Components of biodiversity and natural resources covered / measured

Concerning the components of biological diversity, again, the Environmental Charter is the starting point which defines the environmental fundamentals: humans, land and soil, ecosystems and endemism (Ministere de la Justice n.d.: 5). Ecosystems are defined as an ensemble of flora, fauna and microbial elements integrated in their environment forming a rich ecologic system (Ministere de la Justice n.d.: 8). According to this, the EIA guidelines (i.e. the general guidelines and the sectoral guidelines) refer to three components of the environment:

- The **physical environment**, including climate, meteorological conditions and air, soil, geology and relief and water and hydrological cycle,
- The **biological environment**, including ecosystems, fauna, flora and vegetation and
- The **human environment**, including social, economic, cultural and spatial conditions (Ministère de l'Environnement; Office National pour l'Environnement 2000: 37ff; Office National pour l'Environnement n.d.b: 18; Office National pour l'Environnement n.d.a: 31ff; Office National pour l'Environnement n.d.d: 39ff).

The General EIA Directive requires the description of the components of the biological environment in order to identify the existing ecosystems, the resources of biological diversity, biotopes or particular habitats, protection zones, and of conservation or protection measures as dictated by existing legislation. Furthermore, it stipulates the obligation to define the degree of diversity and endemism, as well as the scientific or conservation interest (Ministère de l'Environnement; Office National pour l'Environnement 2000: 38). Table 13 lists the components for the three aspects of the biological environment (according to the EIA Directive).

Along with this, the Guidelines for the adaptation of conformance of investment with the environment (MEC) specify the indicators of biodiversity as flora, fauna and ecosystems and their respective expressions:

- The abnormal development of vegetation,
- The diminution or disappearance of species and
- The modification or disappearance of ecosystems (Office National pour l'Environnement n.d.b: 22).

For the mining sector, environmental and biodiversity criteria are defined in the Good Governance Principles (even though these are more environmental basics than criteria or indicators):

- The recognition of the international importance of Madagascar's biodiversity as a global heritage,
- Zero tolerance of known extinction or unacceptable probabilities with respect to viable representative habitats,

- The renewable economic value of natural resources including biodiversity, timber and fisheries,
- The fragility of many environments and irreversibility of certain impacts, and
- The target that essential ecological goods and services must be maintained or enhanced (Projet de Gouvernance des Ressources Minerales de Madagascar n.d.a: 3).

Table 13: Components of the biological environment according to the General EIA Guidelines

Source: after Ministère de l'Environnement; Office National pour l'Environnement 2000: 38f

Ecosystems	Flora and Vegetation	Fauna
<ul style="list-style-type: none"> • Types of existing ecosystems: terrestrial, aquatic, marine and coastal, wetlands • Description and functions of the natural environment (particularly ecologically sensitive) • Protected areas and sensitive zones • Existing types of interaction or relation between flora, fauna and ecosystems • Perpetuity and sensitivity (capacity to adapt to changes), proportions of rare or particular ecosystems affected by the project, operation modes etc.) • Local, regional, national or international interest (scientific, cultural, traditional, esthetical, historical, recreational or educational) • Conservation and protection measures and status (in relation to the legislation and national regulations and international conventions) 	<ul style="list-style-type: none"> • Biodiversity of plants: composition of the vegetation (existing species), richness, endemism, particular plants or phyto-genetic resources (ecological, commercial, aesthetic values), rare, vulnerable, threatened or protected species • Characteristics of the vegetation cover: population types, existing sensitive or exceptional populations, percentage of vegetation cover, density, relative abundance, physical appearance, development stadium, annual cycles, distribution regeneration capacity, relation between flora and fauna etc. 	<ul style="list-style-type: none"> • Biodiversity of animals: faunal composition, richness, endemism, rare, vulnerable, threatened or protected species, useful and harmful species • Ecological and behavioural characteristics of animals communities: absolute abundance, density, relative abundance, indication of existence, biogeographical allocation, particular habitats, habitat and territory, migrations, alimentation, reproduction, annual cycles, mortality parameters, relation between flora and fauna etc.

6.4.3 Methods for valuation and quantification of potential impacts

The **Environmental Action Plan** introduced a number of methodological tools, among which the **Environmental Impact Study** (Etude d'Impact Environnemental, EIE) is considered to be the most developed tool in Madagascar, with more than hundred studies carried out for different public and private projects (Ministere de l'Environnement, des Eaux et Forets n.d.: 17). In comparison, only a few **strategic social and environmental assessments** (Evaluations Stratégiques Sociales et Environnementales, ESSE) have been completed, notably in the mining sector (Ministere de l'Environnement, des Eaux et Forets n.d.:17). The Environmental Charter and the Decree MECIE introduce the obligation to implement EIAs according to the technical specifications and the magnitude and location of the projects, distinguishing between three types:

- The **Environmental Impact Study** (Etude d'impact environnemental, EIE) for all investment projects with major impacts on the environment, as specified in Art. 4 and Annex 1 of the decree (Office National pour l'Environnement n.d.c: 1; Ministère de la Justice n.d.: 84),
- The **Environmental Commitment Programme** (Programme d'engagement environnemental, PREE) for all investment projects with minor impacts on the environment, as specified in Art. 5 and Annex 2 of the decree (Office National pour l'Environnement n.d.c: 1; Ministère de la Justice n.d.: 88) and

- The **Adaptation of Conformance** (Mise en conformité, MEC) for existing enterprises, as specified in Art. 38-42 of the decree, following the same procedures as the EIE and the PREE (Office National pour l'Environnement n.d.c: 1; Office National pour l'Environnement n.d.b: 9).

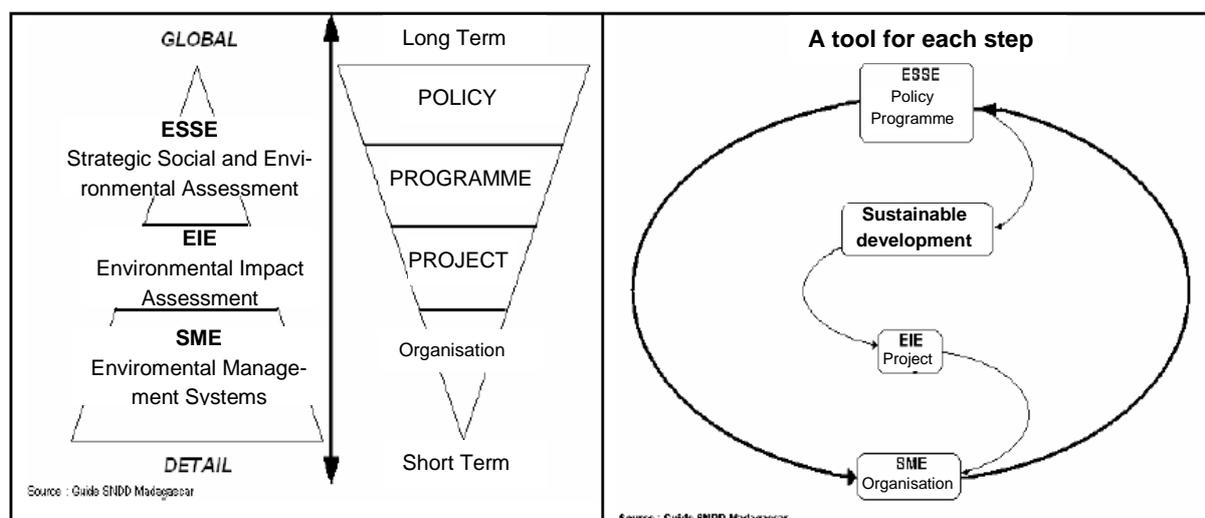


Figure 26: Methodological tools of environmental assessment in Madagascar

Source: after Ministère de l'Environnement, des Eaux et Forêts n.d.: 17

The EIE consists of the prior analysis of potential predicted impacts of an action, the assessment of their scale and definition of the appropriate mitigation measures to ensure the integrity of the environment. Due consideration is given to the best available technologies and economically acceptable costs (Ministère de l'Environnement, des Eaux et Forêts n.d.: 13).

The ESSE (Strategic Social and Environmental Assessment) aims to integrate criteria for sustainable development into strategic decision making (Ministère de l'Environnement, des Eaux et Forêts n.d.: 9). This integration can be complete (including socioeconomic and environmental benefits) or partial (Ministère de l'Environnement, des Eaux et Forêts n.d.: 14).

The MEC was established to integrate environmental issues into management systems of existing enterprises, i.e. contrary to the EIE the MEC builds on an existing, real situation (Office National pour l'Environnement n.d. b: 8, 10). It encompasses two principal components:

- The assessment (within rational limits) of the enterprise's environmental past: restoration and / or compensation of damage caused by its activities, and
- Environmental studies enabling the establishment of a **Project Environmental Management Plan** (PGEP) (Office National pour l'Environnement n.d. b: 9).

All enterprises listed in Annex 1 and 2 of the Decree MECIE are subject to a MEC if they have not yet formally undergone an environmental assessment (Office National pour l'Environnement n.d. b: 10). All projects that usually require a PREE receive an environmental permit (agreement environnemental) and all projects that usually require an EIE receive a certificate of compliance (certificate de conformité) (Office National pour l'Environnement n.d. b: 8).

Identification and assessment of environmental impacts

One of the objectives of the EIE is to identify the effects of a project so that adjustments can be made to limit adverse impacts (Office National pour l'Environnement n.d.a: 29). An environmental planning process has to be integrated into the overall project design, with the goal of minimising adverse environmental effects from the outset, while taking into consideration:

- The protection of sensitive zones and those that are rich of biodiversity,
- The minimisation of ecosystem and biological diversity deterioration and
- The goal of achieving a placement solution, generating socio-economic benefits for the population (i.e. to assure the best social integration of the project) (Office National pour l'Environnement n.d.a: 29; Ministère de l'Environnement; Office National pour l'Environnement 2000: 18).

According to the General EIA Directive the analysis of impacts has to consider the following:

- Identification and assessment of the probable environmental impacts related to the project,
- Identification of measures to mitigate or prevent negative impacts on the environment,
- That the impact assessment implies a value judgement based on the valuation of the environmental components and the norms in force,
- Security measures and
- The implementation of a programme for monitoring and follow-up during the different stages of the project and environmental management plan (Ministère de l'Environnement; Office National pour l'Environnement 2000: 23f, 27).

Art. 23 of the Decree MECIE stipulates the constitution of an ad hoc **Technical Evaluation Committee** (Comité Technique d'Evaluation ad hoc CTE) for the evaluation of each EIE. The Committee will be designated by the Minister of Environment upon proposal by the National Office for the Environment and the Minister of the relevant sector (Ministere de la Justice n.d.: 76).

For the mining sector the obligation to carry out an EIA is set out in the **Mining Code** (Malagasy Mining Statutory Books; LAW no. 99-022 of August 19, 1999 concerning the Mining Code; modified by Law no. 2005-021 of October 17, 2005). This stipulates that any authorisation to open a quarry requires the prior approval of a plan presenting environmental protection measures by the responsible environmental authority. This plan must be elaborated by the mining promoter, following the model set through regulation (Ministère des Mines 2007: 24).

6.4.4 Determining significance and thresholds

The EIA Directive requires the prediction and identification of potential impacts, as well as the analysis and evaluation of the scale, importance and significance of the key effects. The scope of the studies depends on the gravity of the impacts, the vulnerability of the components of the environment that require protection, the nature and complexity of the project and available information relating to the site (Ministère de l'Environnement; Office National pour l'Environnement 2000: 12f). As the impact evaluation builds on a **value judgement**, the Directive notes that the evaluation criteria may be determined using a participatory approach and take into consideration the opinion of concerned parties (Ministère de l'Environnement; Office National pour l'Environnement 2000: 24). Furthermore, the quantitative assessment has to consider the following criteria:

- The intensity or magnitude of the impact with regard to the disturbance of the environment, the sensitivity, vulnerability, singularity or rarity of the affected component,
- The dimension and scale of the impact (spatial dimension e.g. affected area),
- The duration of the impact (temporary or irreversible impacts),
- The frequency of the impact and the probability that it will occur,
- The level of uncertainty of the impact,
- The value of the component to the potentially affected population,
- The risks for health, security and human well-being, and
- Cumulative effects between the affected components and other components (Ministère de l'Environnement; Office National pour l'Environnement 2000: 24f; Office National pour l'Environnement n.d. b: 18f).

After the evaluation and the analysis of the result, impacts are classified, which may lead to a distinction between:

- Positive and negative,
- Direct and indirect, and
- Cumulative impacts (Ministère de l'Environnement; Office National pour l'Environnement 2000: 25).

In the mining sector assessments aim to determine whether an extractive project should be accepted or rejected on environmental grounds and, if accepted, how and under what conditions (PGRM Projet de Gouvernance des Ressources Minérales de Madagascar n.d.: 2). Art. 15 of the Malagasy Mining Code restricts activities inside protected areas, forbidding prospecting, research and mining exploitation (Ministère des Mines 2007: 25). Common conditions that are established (and subject to monitoring) include:

- No known extinctions,
- Maintenance of viable communities and populations over the long-term,
- Range of biodiversity is not compromised,
- Maintenance or improvement of environmental goods and services and ecological processes,
- No-go or set-aside areas (parks and reserves), and
- Promotion of the production of renewable natural resources if this contributes to development and / or conservation (PGRM Projet de Gouvernance des Ressources Minérales de Madagascar n.d.: 2).

6.4.5 Mitigation hierarchy

The mitigation of impacts (usually the term “atténuation” is applied, only in some cases is “mitigation” used) consists of actions or measures to prevent, avoid or reduce negative impacts or to increase benefits for the environment (Ministère de l'Environnement; Office National pour l'Environnement 2000: 25). Adequate mitigation and / or compensation measures have to be determined for each stage of activity, source of impacts, action or activity that has a negative influence on one or several components of the environment (Ministère de l'Environnement; Office National pour l'Environnement 2000: 9,

25f; Office National pour l'Environnement n.d.a: 29). This implies the development of strategies to reduce adverse impacts and to consider (and / or choose) alternatives if these are less harmful to the environment (Ministère de l'Environnement; Office National pour l'Environnement 2000: 9, 12). During the implementation of the project the **environmental monitoring and follow up** have to confirm:

- The implementation of protection and mitigation or compensation measures, and
- The establishment of new mitigation or restoration measures, if appropriate (see Figure 45) (Ministère de l'Environnement; Office National pour l'Environnement 2000: 12).

The EIA Directive cites as an example for compensation measures the indemnification of dispossessed people. This example does not refer to biological diversity, but rather to the socio-economic environment. According to the Directive the estimated costs for the proposed measures must be presented in the EIE if possible. Furthermore the Directive requires the definition of residual impacts that remain after the application of mitigation measures (Ministère de l'Environnement; Office National pour l'Environnement 2000: 26). These are subject to an environmental follow-up.

A distinction is made between general and specific mitigation and compensation measures. The former aim to mitigate the negative effects of a project as a whole while the latter are used to address the negative impacts on a particular component of the environment (Ministère de l'Environnement; Office National pour l'Environnement 2000).

Mitigation measures and restoration of past damages according to the MEC

Some enterprises might have already implemented mitigation measures for negative impacts before undertaking an MEC. Therefore the MEC has to present (the format of Table 14 is proposed by the General Guidelines for the MEC) and justify the relevance of these measures (Office National pour l'Environnement n.d.b: 26).

Table 14: Table format proposed for the MEC

Source: Office National pour l'Environnement n.d.b: 26

Year	Action	Costs	Results

In the case that no measures have yet been implemented, appropriate actions or measures to prevent, avoid or reduce negative impacts have to be established (Office National pour l'Environnement n.d.b: 26). According to the General Guidelines for the MEC this can be ideally done in a table as shown in Table 15. The general provisions for mitigation measures and follow-up are applicable as for EIEs (see above).

Table 15: Table with environmental liabilities and corresponding measures

Source: Office National pour l'Environnement n.d.b: 27

Environmental liability	Action	Estimated costs	Expected schedule

Examples of particular mitigation measures for the case of the **Environmental and Social Assessment of Nosy Be** (Évaluation environnementale et sociale du pôle de Nosy Be) are:

- Minimising work in the flood zone, to be planned at the design stage,

- Measures to protect the banks and slopes during construction,
- Rehabilitation of lodgings and quarries used,
- Suitable compensation for resettled populations in accordance with the resettlement action plan, and
- Measures to protect forest cover in the most sensitive areas and to reduce the speed of vehicles in residential areas (Tecsult International Limitée 2005: 38f).



Figure 27: Location of the Pole of Nosy Be

Source: Tecsult International Limitée 2005: 72

6.4.6 Determining offset demand and compensation measures

Mitigation and compensation measures are presented together in the project EMP, divided into general and specific measures. General measures can include:

- Provision of mechanisms for the participation of local populations in order to promote the integration of the project into the social and economic environment,
- **Preservation** of the important components of the biological environment (habitats of flora and fauna, mangroves, corals etc.),
- Ensuring that rules concerning restricted or protected areas and their buffer zones are respected,
- Instruction of staff to emphasise practices with the least impact on the environment,
- Design and implementation of measures to **reduce** to a minimum environmental impacts during construction and operation,
- **Compensation** for residual impacts and

- **Restoration** of the site (e.g. after mining exploitation) (Office National pour l'Environnement n.d.a: 38f).

The sectoral guidelines that elaborate EIAs for forestry, tourism and the oil and gas sector all include a table with examples of specific mitigation and compensation measures for the different probable impacts on the physical, biological and human environment (Office National pour l'Environnement n.d. a, d; Ministère de l'Environnement, Office National pour l'Environnement n.d.). Table 16 lists specific measures for impacts on ecosystems, flora and fauna, based on the EIA Guidelines for tourism projects. Despite the differences, the measures for the three sectors share a number of similarities.

Mitigation policies are adopted in the oil and mining sector seeking to restore the environment to its status prior to the implementation of the mining project, and recently net gain policies are set by some companies (PGRM Projet de Gouvernance des Ressources Minerales de Madagascar n.d.: 2).

Table 16: Indicative list of mitigation and compensation measures for tourism projects

Source: extract from Ministère de l'Environnement; Office National pour l'Environnement n.d.: 39ff.

Impact	Exemplary measures
Ecosystems	
Possible modification of ecosystems and their balance	<ul style="list-style-type: none"> • Inventory of the main biotopes and associated existing species at a stage prior to the development of the project, in order to propose measures to avoid adverse impacts on the biological environment • Identification and protection of characteristic and vulnerable ecosystems (wetlands and watercourses, coral reefs, mangroves and other marine ecosystems, feeding, reproduction and migration zones of the fauna)
Disappearance of rare ecosystems and the associated resources	<ul style="list-style-type: none"> • Establishment of conservation zones in ecologically important areas (forests, lakes or marine), ensuring a sufficient area for the protection of biological diversity, the functioning of ecological processes and the preservation of their scientific, tourism-related, socio-economic and cultural values • Acquisition of knowledge on the economic valuation of the resources • Determination and respect of the capacity / resilience of the environment
Flora and Fauna	
Loss of biological diversity	<ul style="list-style-type: none"> • Control or interdiction of the extraction of biological resources (coral, other animals and plants) according to existing exploitation criteria and conditions of responsibility that may be assumed by public authorities and the project proponent • Identification, localisation and preservation of species that are rare and threatened with extinction • Measures to protect aquatic habitats, wetlands and reproduction zones (birds, amphibians) • Development of a schedule for tourism-related activities, which takes into consideration the use of land, water and sea areas by fauna and the sensitive periods (migration, reproduction, etc.)
Loss and modification of habitat and species quantity and quality	<ul style="list-style-type: none"> • Maintenance of corridors to enable the movement and distribution of animals between areas • Measures to control the introduction of exotic (non-native) species
Disturbances due to corridors in the vegetation and the creation of transport infrastructure	<ul style="list-style-type: none"> • Adequate choice and planning of the alignment of roads, taking into consideration the existing ecosystems and water surfaces • Control of access to tourist zones
Loss of surface or modification of vegetation	<ul style="list-style-type: none"> • Adopting cutting practices that enable the natural regeneration of the forests • Avoidance of deforestation or destruction of the vegetation inside of ecologi-

tion	cally important zones and in peripheral zones of water surfaces
Disturbance or destruction of plant ecosystems through fire	<ul style="list-style-type: none"> • Creation of a fire control system • Establishment of a management programme for fire fighting • Defence of valuable areas
Change of the natural behaviour of animals	<ul style="list-style-type: none"> • Measures to avoid disturbance of the natural behaviour of animals due to the presence of humans (e.g. noise, taking of photos, feeding)

6.4.7 Implementation and responsibilities / costs

The Malagasy Mining Code recognizes the “**polluter pays principle**”, i.e. the liability of the originator of an adverse impact on the environment. In Art. 99 it notes that “Any natural person or legal entity, who carries out mining activities, are obliged to take the required protection measures to minimize and to repair all damages resulting from the works carried out within the limits of these activities. The aforementioned person is responsible for all environmental deterioration from their work” (Ministère des Mines 2007: 57). Furthermore, the new Art. 103 adds: “To clear himself from the environmental rehabilitation obligation, the permit holder should receive a discharge of the authority that gave the environmental authorization, after the in situ report of the completion of rehabilitation works [...] The environmental responsibility of the holder as well as of his possible entitled beneficiary remains so much whole until they cannot justify the obtaining of the corresponding environmental discharge” (Ministère des Mines 2007: 58).

6.4.8 Project Case Study: Rio Tinto ilmenite project – long-term commitments to the prevention, mitigation and compensation of impacts on the environment



Figure 28: Location of the QMM ilmenite project

Source: World Bank 2007:4

In the late 1980s the Rio Tinto Group, a UK-Australian based mining company, started to explore a major mineral sands resource in the Fort-Dauphin region in southeastern Madagascar (Rio Tinto 2007, n. pag.; QMM n.d.: 3) (see Figure 28). The mining project was initiated under the name of **QIT Madagascar Minerals** (QMM) in collaboration with the Malagasy Government (with Rio holding 80 % and the government holding 20 %) (QMM n.d.; 12740: n. pag.). The operational stage has yet to start, but first ilmenite production is expected for the end of 2008 (Rio Tinto 2007, n. pag.) (see Figure 30 for information on the mining process). Nevertheless, **extensive pre-emptive studies** have been undertaken since the beginning of the project. The project development work has included detailed **preliminary social and environmental studies** e.g. biodiversity research and conservation projects such as biological inventory studies, seed biology and conservation projects and the establishment of three conservation zones within the littoral forest (Rio Tinto 2006b: 10; Rio Tinto 2007: n. pag.).

After several years of negotiation a **legal and fiscal framework agreement** between QMM and the Government of Madagascar was concluded in 1998 (Rio Tinto 2007: n. pag.) and a regional planning process was initiated in 1999, which was supported by a wide range of stakeholders, including local village leaders, central government, local officials, donors (World Bank and USAID), local businesses and NGOs and chaired by a **Regional Development Committee** (CRD) elected to lead the planning process (QMM n.d.: 6). In 2001 an independent biodiversity committee was formed, composed of biodiversity experts in various fields of longstanding experience to contribute to strategic and practical matters such as monitoring biodiversity, performance indicators and the establishment of biodiversity offsets at the site (QMM 2007c: 1; Rio Tinto 2006b: 10).

Rio Tinto's commitments to biodiversity

In 2006 the QMM site was declared the first "**net positive impact**" pilot project helping to develop methodologies and measures for the environmental and social performance of the Rio Tinto Group (Rio Tinto 2006b: 10). Rio Tinto is aware of its responsibility as a "global player", recognising the importance of the conservation and responsible management of biological diversity as a business and societal issue (Rio Tinto 2004:3). Therefore the company has committed to make a net positive impact on biodiversity at its operating sites around the world by intending "to leave as much, if not more, natural variety in place after our operations have closed than existed before" (Rio Tinto 2006b: 8). As biodiversity is seen in relation to communities which may depend on these natural resources, the Rio Tinto biodiversity strategy provides a framework for managing the interests and concerns of a wide range of groups, including traditional landowners, local communities, NGOs, regulators and the scientific community (Rio Tinto 2006b: 8). These goals are based on corporate environmental policies aimed at excellence in environmental performance, compliance with all environmental laws and regulation and the development and implementation of internationally recognized management systems and voluntary commitments (Rio Tinto 2008: 10). To assure their implementation a "**Practical Guide to Integrating Biodiversity into Rio Tinto's Operational Activities**" has been developed to provide assistance to the following activities (Rio Tinto 2004: 6):

- Assessment and evaluation of biodiversity in and around their operations,
- Establishment of appropriate mitigation measures to reduce impacts,
- Identification of opportunities to protect or enhance biodiversity,
- Integration of different perspectives, global and local, into the assessment and management,
- Development of synergies between business unit biodiversity programmes and external local and regional environmental programmes, and
- Optimisation of links between operational biodiversity and community relations programmes.

Within the scope of the QMM ilmenite project a **Social and Environmental Impact Assessment (SEIA)** was conducted over a two year period (1999-2001) for the Mandena sector (see Figure 29) resulting in the issue of an environmental permit by the Malagasy government in November 2001 (QMM n.d.: 4). During the assessment a range of environmental factors was identified, distinguishing between **physical components** including soil and water (QMM; Madagascar's National Office for the Environment 2001: 22), **biological components**, including flora and fauna (sub-components: littoral forest, wetland environment, open environment, freshwater environment, estuarine environment, marine environment) (QMM; Madagascar's National Office for the Environment 2001: 33), **and social components**, including health (e.g. air emissions), landuse (e.g. tourism potential) and economic activities (e.g. local employment) (QMM; Madagascar's National Office for the Environment 2001: 42, 54, 62).

A set of **biodiversity management performance indicators**, relating to the social and environmental programmes and conservation actions, will be piloted in Madagascar as part of Rio Tinto's commitment to achieving a net positive impact on biodiversity at operating sites. The project will examine the commitment in place with the Malagasy Government and see how this can be measured in terms of net positive impact and in terms of biodiversity loss and gain (Rio Tinto 2006a: 1).

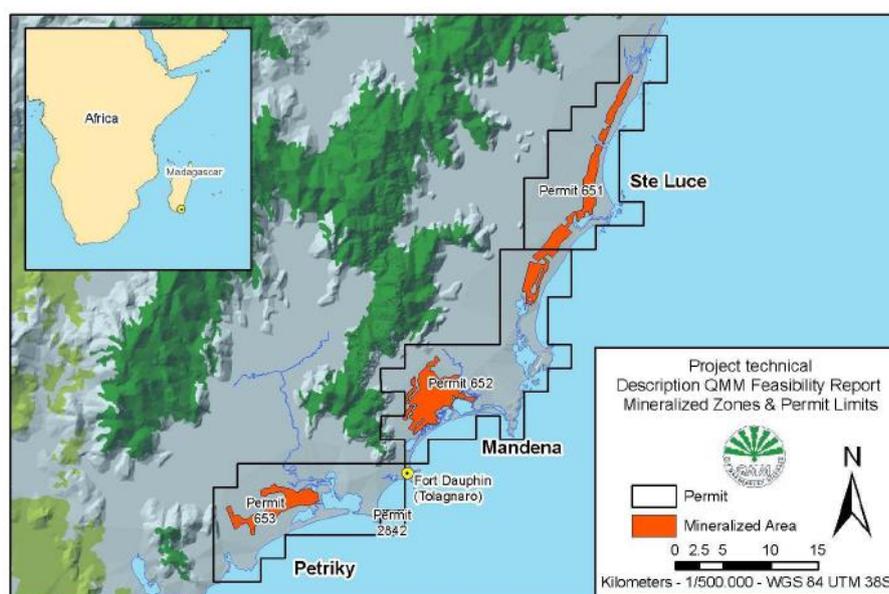


Figure 29: Mineralized zones in three sectors of QMM ilmenite project

Source: World Bank 2007: 5

In the SEIA, environmental and social measures were developed, taking into consideration the laws and regulations of Madagascar, the mining industry good practice standards and the accepted international standards for industrial and mining projects (QMM; Madagascar's National Office for the Environment 2001: 19). In this context the term "environmental measures" refers to the "measures for the elimination, mitigation or compensation as a result of the project's impacts on the social and natural environment" (QMM; Madagascar's National Office for the Environment 2001: 4). It should be noted that some measures are still being established, in order to be properly adjusted to the situation, and may be modified and improved or complemented by further measures whenever appropriate and agreed with external experts, representatives from the government of Madagascar and the populations concerned (QMM; Madagascar's National Office for the Environment 2001: 19).

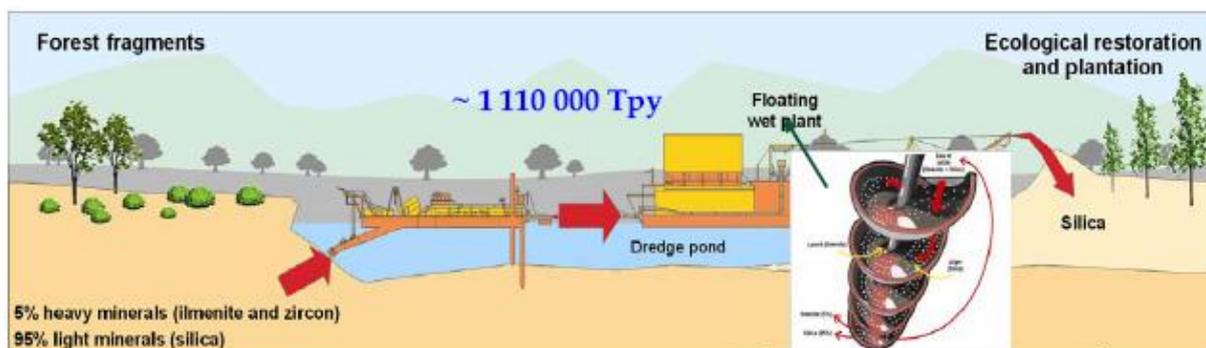


Figure 30: Process of ilmenite mining in Madagascar

Source: World Bank 2007: 9

Project Environmental Management Plan

One of the fundamentals of the SEIA undertaken for the QMM ilmenite mining project is the Project Environmental Management Plan (PEMP) which has been developed in accordance with the applicable provisions of the MECIE, the Mining Code and Interdepartmental Order no. 12032/2000. This order defines the PEMP as “a programme for implementing and monitoring the measures proposed by the Environmental Impact Assessment in order to avoid, eliminate, reduce and eventually compensate for the project’s damaging effects on the environment” (QMM; Madagascar’s National Office for the Environment 2001: 4). In this sense the PEMP encompasses notably two programmes:

- A monitoring programme, whose main objective is to monitor implementation and to verify the application of environmental measures proposed in the SEIA, and
- A follow up programme, whose primary objective is to follow up on the development of some of the components of the natural and human environment (QMM; Madagascar’s National Office for the Environment 2001: 4).

The PEMP is designed to be dynamic and flexible and will undergo periodic revisions and updates (QMM; Madagascar’s National Office for the Environment 2001: 109). Nevertheless, QMM assumes overall responsibility for the development and implementation of all measures and, whenever appropriate, will define field work, make decisions in the case of unexpected events, prepare reports and report to the Malagasy authorities (QMM; Madagascar’s National Office for the Environment 2001: 73).

Measures addressing impacts on flora and fauna

According to the PEMP, measures to address impacts on flora and fauna issues are proposed through the following fields of activity:

- Mandena Mining sector conservation and rehabilitation,
- Planting outside the mining sector,
- Aquatic fauna downstream and upstream of the weir, and
- Marine flora and fauna (QMM; Madagascar’s National Office for the Environment 2001: 86ff).

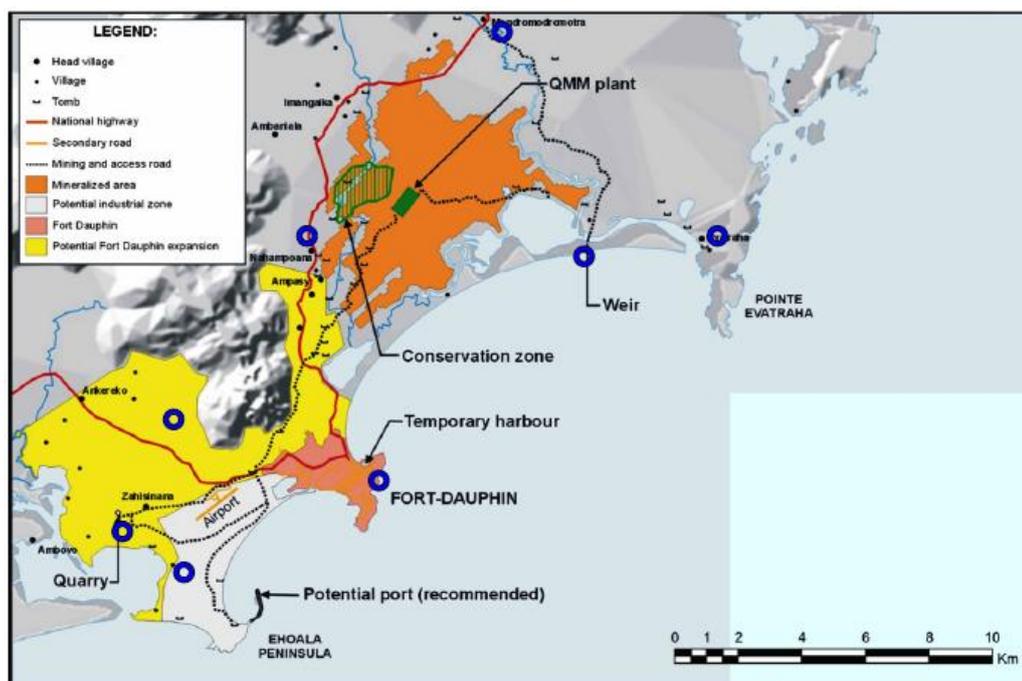


Figure 31: QMM plant and conservation zone in the Mandena sector

Source: World Bank 2007: 14

An approach combining **conservation** and **rehabilitation** measures is applied in the Mandena sector's wetlands and littoral forests. On the one hand this comprises the establishment and enhancement of an (already degraded) **conservation zone** of 160 hectares of littoral forest (see Figure 31 and Figure 32) to preserve the important flora and fauna of this type of forest and wetlands, including endemic plant species. This will serve as a seed reservoir etc. Also included are seeding (targeted species of plants) and translocation (animals) procedures (QMM; Madagascar's National Office for the Environment 2001: 5). On the other hand rehabilitation of the entire mining zone (2,120 ha) is proposed, which includes restoring ecosystems and planting fast-growing, utilitarian species. In this way an area of around 100 hectares will be rehabilitated annually in parallel to the mining activities. Three-quarters of the area (1,590 hectares) that is presently mostly open environment, will be planted with fast-growing species as a significant compensation measure for impacts (QMM; Madagascar's National Office for the Environment 2001: 85f).

To secure the benefits of the littoral forest for the daily needs of the Fort-Dauphin population, (e.g. as a source of wood for cooking and building homes) the planting of fast-growing valuable species such as Eucalyptus over a 500 hectare area outside of the Mandena mining sector, is proposed for the next five years (QMM; Madagascar's National Office for the Environment 2001: 87).

With respect to the impacts on aquatic fauna caused by the construction of a weir, a conservation and restoration programme is proposed that focuses on the monitoring of aquatic wildlife populations and their exploitation, the restoration of aquatic environments (aquaculture, development of spawning grounds through planting of appropriate aquatic vegetation and the conservation and sustainable management of freshwater species and the coastal zone (QMM; Madagascar's National Office for the Environment 2001: 88).



Figure 32: Littoral forest restoration after clearing

Source: QMM 2007a: 15

For marine flora and fauna a monitoring programme will be undertaken to continuously evaluate the environmental baseline and changes due to impacts and the proposed environmental measures (QMM; Madagascar's National Office for the Environment 2001: 89f).

Table 17 summarises the objectives of the **QMM biodiversity programme** and the primary project-related achievements.

Table 17: Comparison of biodiversity programme objectives and project-related achievements

Source: QMM 2007a: 3, 6, 9, 12, 16, 19; World Bank 2007: 32ff

Objectives of biodiversity programme	Primary project related achievements
Conservation, monitoring and management of terrestrial and aquatic biodiversity and habitats	
<ul style="list-style-type: none"> • Developing an extensive database on flora and fauna biodiversity • Managing natural habitat to enhance its value • Enhancing scientific knowledge of ecosystems and species • Supporting creation of Protected Areas (Système des Aires Protégées de Madagascar – SAPM) • Setting the conservation strategy for threatened and endemic species (seed conservation, species propagation, animal translocation, etc) • Identifying and setting biodiversity offsets • Initiating collaboration with students / experts (QMM 2007a: 3) 	<ul style="list-style-type: none"> • Conservation Zones and Sustainable Management plan created on mining sites and outside (offsets) e.g. in the Mandena sector a 230 hectare Conservation Zone and 2,000 hectare under project custody (mine area) and in Tsitongambarika 40,000 hectare area are established and set aside as an offset in 2008 (QMM 2007b: 1) • 1,677 hectares of protected areas created and included into SAPM • 70% of Field Guide completed (400 species from littoral forest), with publication due in 2008 • Biodiversity Monograph completed: Biodiversity, Ecology and Conservation of Littoral Ecosystems In South-Eastern Madagascar, Tolagnaro (Fort-Dauphin) • Seed conservation: roughly 50 lots seeds sent to Millennium Seed Bank (MSB) at Kew • Endemic fauna conservation plan in place (QMM 2007b: 2)

	<ul style="list-style-type: none"> • Endemic flora monitoring plan in all forest and conservation areas (QMM 2007b: 2) • Environmental education: bird watching event with Bird Life in Mandena, Ste Luce & Ivorona (QMM 2007b: 1f; World Bank 2007: 32)
Sustainable management of natural resources	
<ul style="list-style-type: none"> • Setting agreements and co-management of land use with the local community (DINAs – see below) • Promoting integrated conservation and development initiatives such as ecotourism, beekeeping, handicraft, nursery, agriculture, etc. • Identifying alternatives for threatened resources • Building capacity in management and environmental education • Monitoring of threats and deforestation (QMM 2007a: 6) 	<ul style="list-style-type: none"> • Co-management contract (DINA) signed in Ste Luce and Ambatotsirongorongo (21,000 hectares) • Co-management contract (DINA) in progress in Petriky and Andrakaraka (done) • Objective of capacity building for COGE (Comité de Gestion) management • Strengthening of local agriculture, beekeeping, composting, vegetable production, handicrafts and ecotourism e.g. an environmental cycle was established (World Bank 2007: 35)
Plant production for rehabilitation and stabilisation	
<ul style="list-style-type: none"> • Plant production in Mandena nursery (capacity: 150,000 plants per year) • Reforestation with communities and plantation management • Capacity building in community nursery and forest plantation • Plant production for road rehabilitation and use after mining • Vetiver⁸ production for road and dune stabilization (QMM 2007a: 9) 	<ul style="list-style-type: none"> • 100 hectares planted in 2007. EMP commitment achieved with 600 hectares planted ahead of mining (over 650,000 trees, with an exceptional 95% survival rate) • Set up Réserve Foncière de Reboisement with CIREEF to secure and manage plantations (above) in the region • 300,000 vetiver plants produced for road and dune stabilisation • 2007 plant production on-going for road and infrastructure rehabilitation, as well as landscaping and community planting (World Bank 2007: 33)
Ecological restoration	
<ul style="list-style-type: none"> • Building knowledge of ecosystem structure and succession • Trials on wetlands and littoral forest restoration • Managing top soil conservation • Improving degraded forest and habitats • Corridor and watershed restoration • Dune and road banks restoration (QMM 2007a: 12) 	<ul style="list-style-type: none"> • Littoral forest restoration programme on-going: seed harvesting and treatment / plant production in nursery • Forest restoration trials on several degraded land parcels • Top soil management and conservation programme ongoing in collaboration with construction team • Wetland restoration trials (World Bank 2007: 34)
Supporting regional initiatives on environment	
<ul style="list-style-type: none"> • Working in partnership with the regional stakeholders including the Department of Forest and Environment, NGOs, USAID, universities and scientific institutions • Supporting the creation of Protected Areas 	<ul style="list-style-type: none"> • Signed Phase II of the QMM / USAID partnership • Support regional nursery (120,000 trees / year) and regional reforestation • Support regional domestic energy strategy

⁸ a grass species

<p>(SAPM)</p> <ul style="list-style-type: none"> • Supporting the regional domestic energy strategy, and reforestation programme including nurseries • Participating in the forest fire protection strategy • Supporting water and energy initiatives for Fort-Dauphin • Project funding through the Rio Tinto partnership programme (QMM 2007a: 19) 	<ul style="list-style-type: none"> • Support local water and forests CIREF in various activities • Partnership with World Bank on environmental offset (Bay of Ste Luce) (World Bank 2007: 36) • Plantation programme for the production of wood products, firewood and charcoal, managed by the rural communities(QMM 2007b: 1)
Environmental surveillance and monitoring	
<ul style="list-style-type: none"> • Elaborating on the SEIA, EMP (Environmental Management Plan) SEMP (Sectoral EMP) and GDP (Ground Disturbance Permit) plans • Monitor effects on the environment • Compliance with ONE commitments (from the Office National de l'Environnement) • Compliance with Rio Tinto's standards and guidelines (QMM 2007a: 16) 	<ul style="list-style-type: none"> • Monitoring programme of over 15 biodiversity indicators associated with construction and mine sites to assess the changes over time (if any) • Implementation of mitigation measures (under assessment: forest areas, birds, reptiles and amphibians, lemurs and small mammals, marine turtles, whales, fish, corals, benthos, crocodiles, vegetation, lobsters, etc.)

It will not always be possible to replace exactly what was there before the project, but biodiversity offsets may be employed. Potential offsets include the Tsitongambarika conservation zone, outside the mine concession, where Rio Tinto has funded research on fauna and flora for the past two years (Rio Tinto 2006a: 1).

With respect to compensation or indemnification for communities or individuals, emphasis is placed on in-kind compensation for any disruption rather than monetary settlement. Where the latter is inevitable, the amount of the damages, in accordance with the laws of Madagascar, will redress all damage incurred (QMM; Madagascar's National Office for the Environment 2001: 19f).

An **Integrated Compensation Programme** (ICP) was established to integrate the numerous environmental and social measures expressed in the EMP and to resolve the sometimes artificial distinction between these, aiming to unite both social and environmental measures in support of livelihood protection and promotion (QMM n.d.: 16). The ICP is formalized through a **DINA** – a traditional Malagasy social contract designed to manage potential sources of social conflict, which describes respective roles and responsibilities of the signatories (Rio Tinto 2007: 3f). This enables QMM to customise the EMP measures to specific local and even household realities. Even though these might show a great variation between different communities, there will be certain common characteristics such as responsiveness to community expressions of interest; willingness to take a holistic approach to environmental, developmental or population work; and the willingness to pursue partnerships (QMM n.d.: 16f). Generally this will include applying appropriate environmental practices, including:

- A clear definition of the standard's objective,
- A detailed description of the actions to be taken and / or the specific guidelines to be followed,
- The identification of those responsible for applying the standard and a description of their respective responsibilities, and
- The identification of the follow-up or monitoring parameters and the contents of the reports to be prepared (QMM; Madagascar's National Office for the Environment 2001: 107).



Figure 33: Signature of Mandena DINA in 2002

Source: QMM 2007a: 7

Responsibilities and Costs

An important aim of the project is to secure a consensus-building approach for the implementation of the mitigation, development and compensation measures. This will help ensure that the proposed measures correspond to the real needs of the communities and individuals affected by the construction and operations of the various infrastructures (QMM; Madagascar's National Office for the Environment 2001: 75). This means that choosing, designing and implementing final measures will be ideally done together with the villagers and residents of the impacted communities as well as with concerned governmental authorities and other stakeholders (QMM; Madagascar's National Office for the Environment 2001: 75). Hence, the organisational structure for the implementation of measures builds on two pillars:

- A team of QMM specialists acting as technical advisors in charge of monitoring the development and / or application of the environmental measures, as well as managing the environmental monitoring programme and
- Liaison committees, including representatives from QMM, the communities affected and the authorities concerned, who may address various tasks, e.g. participate in discussions to optimise the design of structures or of various aspects of project components during feasibility studies.

Additionally, these two pillars may be complemented by other organisations e.g. labour force training, public services, use of land, education, support for agricultural activities and the production of livestock which will be financed by an economic, community and social development fund created by QMM (QMM; Madagascar's National Office for the Environment 2001).



Figure 33: Environmental monitoring at a water pumping station

Source: QMM 2007a: 18

The implementation of the mitigation and conservation measures is undertaken in parallel with the mining process on an ongoing basis (QMM; Madagascar's National Office for the Environment 2001: 108) creating different types of costs:

- Capital costs for construction or for modification of the works resulting from environmental management and mitigation of project impacts,
- Current expenses for application of the proposed mitigation measures, such as rehabilitation of the mined zones, for compensation, etc. and for carrying out the related programme,
- Programmes for monitoring and follow-up of the components of the natural and human environment affected by the project activities, and
- A significant voluntary decrease in project revenues, resulting from the decision to propose the establishment of conservation zones in significant areas of the Fort-Dauphin deposit.

6.4.9 Critical discussion

Madagascar faces a **number of fundamental problems** that hinder the implementation of biodiversity conservation and compensation. First of all, information on biodiversity and landscape is basically provided by NGOs and the management of **information is still archaic and the access and exchange of information is limited** (Andriambelo 2008).

Moreover there is a **lack of awareness amongst the population** with respect to environmental protection. The population hardly shows any interest in these issues and are more concerned with their personal and economic situation (Andriambelo 2008).

Indeed, this is a huge problem, as the local population causes significant impacts on the environment, most notably through forest clearance, logging for firewood use (heating and cooking) and building needs. The **cumulative effect** of these practices is a major threat to the Malagasy biodiversity. Up until now these **small- to large-scale impacts** (when seen separately) **have not been addressed** by compensation instruments except at a relatively local scale where there are combined conserva-

tion and rural development programs. However, many protected areas have assessed local impact importance of agriculture, hunting or wood extraction (Nicoll 2008). An example of one approach to addressing this aggravating factor is the organisation of an environmental protection competition between several villages. The villages were classified according to defined criteria and an amount of money was distributed among the participating villages based on this classification (Andriambelo 2008).

A further obstacle is the **pertinence of measures**, once these are implemented (as it is hard to obtain broad acceptance) (Andriambelo 2008).

Summarising, the main challenge is the implementation of biodiversity considerations (Henri 2008).

The legal provisions and guidance for EIA provide a relatively good basis for impact mitigation. However they only cover impacts of **major projects**. More specific information should also be given on compensation for impacts on biological diversity. In this context the General EIA Directive cites as a compensation example the indemnification of dispossessed people rather than an example related to the environment and biodiversity.

The mining sector was presented as a positive example for the implementation of environmental compensation in the scope of EIA and additionally established voluntary biodiversity offsets. However, there are several objections remaining. First of all, in the cited case, the Rio Tinto Group is a worldwide operating UK-Australian mining company and the environmental benefiting actions are related to the company's corporate (environmental) policy and biodiversity commitment. These are progressive compared to the overall situation in Madagascar, as the environmental standard in Australia and the UK is much higher. Therefore, **it remains doubtful, whether the example of Rio Tinto stands for the whole or at least a considerable part of the Malagasy mining sector** or whether this is a single example due to international assistance.

6.5 Selected aspects of impact mitigation regulation in Mexico

6.5.1 Scope and objectives

The federal organization of the Republic of Mexico (see Figure 34) results in concurrent powers to address environmental issues at federal, state and municipal government levels, notably for legislation in the States, to whom responsibility for environmental and ecological matters is devolved. The federal government is mostly concerned with directing environmental policy and regulations, while the state and municipal authorities are engaged in matters of development and implementation (Commission For Environmental Cooperation 1998: 108f).



Figure 34: Federal organisation of the Republic of Mexico

Source: Milebymile.com (2007): Mexico RV Road Map Travel Itineraries, Available at: http://www.milebymile.com/main/Mexico/Mexico_road_map_travel_guides.html. Accessed: 20.10.2008.

At federal level the **Biodiversity Code** (Código para la Biodiversidad del Estado de México) aims to systematically integrate legal aspects that relate to environmental issues (Estado de Mexico 2005). General objectives identified include:

- The promotion and regulation of the sustainable use, conservation, remediation, rehabilitation and **restoration** of natural resources,
- Furtherance of the society's participation in actions relating to preservation, remediation, rehabilitation and restoration of the ecological balance and environment and all biodiversity protection activities, and
- Assurance of the protection, conservation, preservation, rehabilitation, restoration, recovery and remediation of biodiversity and its components.

Art. 2.60 of the Biodiversity Code, concerns environmental politics and its instruments and establishes a number of criteria. Firstly, the preservation and conservation of the ecological balance and the internalisation of costs are indispensable to the conservation of the environment, biodiversity and natural

resources. Secondly, the restoration, remediation, recovery and rehabilitation of the ecological balance are essential in order to face climate-related challenges and to stop desertification, erosion and salinisation of soils as well as the disappearance of flora and fauna (Estado de Mexico 2005: 45f).

Furthermore, Art. 2.82 introduces the obligation for all stakeholders, including state and municipal authorities, the social sector and private organisations, communities and any individual, to act in a way that preserves, conserves, remediates, rehabilitates, recovers, restores and protects natural protected areas, biological diversity and its ecosystems (Estado de Mexico 2005: 52).

Protected Areas



Figure 35: Map of Natural Protected Areas in Mexico

Source: TodoMonografias.com (2006) Áreas Naturales Protegidas in Mexico. Available at: <http://www.todomonografias.com/agronomia/areas-naturales-protegidas-en-mexico/>; Accessed: 20.10.2008.

The most efficient instruments for conserving biological diversity in Mexico are the **Natural Protected Areas** (Áreas Naturales Protegidas ANP, see Figure 35), in particular the **Federal Program for Natural Protected Areas** (FPNPA) (Estado de Mexico 2005: 1; Nadal 2001: 2), which is run by the **National Institute of Ecology** (INE) as a dependent of the **Ministry for the Environment and Natural Resources** (SEMARNAT). According to the official definition of the INE, natural protected areas are “parts of Mexico’s territory which are representative of different ecosystems and their biodiversity, and in which the ‘original environment’ has not been essentially altered by human activities” (Nadal 2001: 4). The **General Act on Ecological Equilibrium and Environmental Protection** (LGEEPA), which regulates the principles of the constitution in relation to environmental matters, includes the legal definitions of these ANPs, classifying them into six different categories: biosphere reserves, national

parks, marine national parks, areas for the protection of flora and fauna, special biosphere reserves, and natural monuments (Nadal 2001: 4). The system of natural protected areas is complemented by natural protected ecosystems under the **UMA Pilot Programme**⁹ that aims to integrate the ecosystem approach of the CBD with the political system in the context of conservation and sustainable use of biodiversity (CBD 2006: 9). The ANP and UMA enable the creation, development and fortification of markets for environmental services on local, regional and global levels. These enforce compensation mechanisms as an instrument for the conservation of biological diversity (Estado de Mexico 2005: 25).

Environmental services and voluntary compliance measures

The **National Forestry Commission** (Comisión Nacional Forestal CONAFOR) started the **Program for Payments for Environmental Services** (Pago por Servicios Ambientales de Captura de Carbono, Conservación de la Biodiversidad Y Derivados Agroforestales PSA-CABSA), which focuses on carbon capture, biodiversity conservation and agroforestry (CONANP 2007: 25). With this instrument CONAFOR aims to indemnify forest landowners for conserving forest cover in order to manage and maintain these forests and their functions and to conserve biological diversity (CONANP 2007: 35). Between 2004 and 2006, 94 projects were been carried out with support of the programme. Around thirty communities are now offering projects on the market for avoided deforestation (CONANP 2007: 25). Project proposals need to promote additional maintenance and enhancement activities, and in order to be granted the financial support, projects are required to demonstrate a long-term conservation commitment (compromiso de conservación de largo plazo) (Estado de Mexico 2005: 36), including:

- A forest management programme (Programa de Manejo Forestal),
- Ecological services (servidumbre ecológica),
- Spatial planning (land use plan) or private conservation instruments,
- The existence of units for the management of wildlife or other relevant subjects (CONANP 2007: 36).

The number of voluntary compliance measures seeking to achieve environmental and ecosystem-level protection is increasing. These new approaches are not generated due to obligations under the oversight of environmental authorities, but rather voluntarily with encouragement and support of the latter (Commission For Environmental Cooperation 1998: 107). Examples include the aim to achieve international standards as per ISO 14000¹⁰ and the **FIDE Seal for Electric Energy Savings**, which has been introduced by the National Commission on Energy Savings (Comisión Nacional para el Ahorro de Energía CONAE) (Commission For Environmental Cooperation 1998: 131). With reference to voluntary compliance measures the LGEEPA notes in its section 38:

“Those responsible for the management of a business may, through environmental auditing, voluntarily undertake a methodological testing of [the business’s] operations with regard to the pollution and risk thereby caused, as well as the level of compliance with environmental regulations, international

⁹ The management units for the conservation and sustainable use of wildlife (Unidades de manejo para la conservación y aprovechamiento sustentable de la vida Silvestre) serve for the reproduction and spread of flora and fauna and the generation of products for direct and indirect use.

¹⁰ The ISO 14000 family addresses various aspects of environmental management. The first two standards, ISO 14001:2004 and ISO 14004:2004 deal with environmental management systems (EMS). ISO 14001:2004 provides the requirements for an EMS and ISO 14004:2004 gives general EMS guidelines.

standards and sound engineering practices, for the purpose of designing such preventive and remedial measures deemed necessary for the protection of the environment” (Commission For Environmental Cooperation 1998: 117).

Environmental Impact Assessment

EIA is a major tool for addressing biodiversity compensation issues in the context of project development. Art. 83 of the LGEEPA states that “any activity that causes grave or irreparable damage to the survival of a species must be preceded by an Environmental Impact Assessment and determination of protective measures” (Miller 2001: 36). In addition, the requirements and procedures associated with this instrument are regulated by the Biodiversity Code. According to Art. 2.67 all physical or legal persons have to seek approval from the state environmental authority for all public or private industrial development projects, the modification of existing works and activities or any activities that might affect biological diversity, ecosystems or the ecological balance (Estado de Mexico 2005: 47).



Figure 36: Priority areas of attention concerning EIA in Mexico

Source: Cámara de Diputados del H. Congreso de la Unión 2000: 41

Regarding EIA practice in Mexico, the **Federal Administration of Environmental Protection** (Procuraduría Federal de Protección al Ambiente PROFEPA) identified in its **Administration Programme of Environmental Justice** (Programa de Procuración de Justicia Ambiental) priority areas of attention in terms of EIA at a national level. The zones where diverse productive sectors generate significant environmental impacts are displayed in a map (see Figure 36). Activities and associated impacts and the most notably affected regions for each sector are set out in a table (Estado de Mexico 2005: 44ff). Based on the map and table, objectives, actions, measures and indicators are developed (Estado de Mexico 2005: 48ff). These include:

- The promotion of **restoration, rehabilitation** and / or **compensation** for damages due to the implementation of works or activities under federal competence,
- The coordination of the **National Commission for Natural Protected Areas** (Comisión Nacional de Áreas Naturales Protegidas) and the **National Commission for the Knowledge and Use of Biodiversity** (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad CONABIO) to create programmes for the inspection, monitoring, verification, restoration, rehabilitation and / or compensation of damage; environmental planning and environmental impact assessment in ANPs, and
- Participation in preventive and monitoring contingencies, in the context of EIA (Cámara de Diputados del H. Congreso de la Unión 2000: 49).

6.5.2 Components of biodiversity and natural resources covered / measured

With reference to the components of biological diversity, reference is made to the definition of the CBD. Consequently, the **Mexican National Biodiversity Strategy** defines biodiversity as the degree of variation between living organisms and ecologic complexes, which is expressed at different levels: from the heterogeneity of chemical structures and genes to ecosystem variety (CONABIO 2000: 13). Specifically, this comprises genetic, species and ecosystem diversity:

- Genetic diversity exists between populations as well as between species.
- Species diversity or species richness is the variety between species of different taxonomic groups.
- Ecosystem diversity refers to the diversity of biotic communities and ecological processes (CONABIO 2000: 13).

6.5.3 Methods for valuation and quantification of potential impacts

Environmental Impact Assessment

Environmental Impact Assessment is mandatory under the LGEEPA and the Biodiversity Code. The latter stipulates that Environmental Impact Assessment (Manifestación de Impacto Ambiental MIA) will be evaluated by the environmental authorities prior to a project's approval (or rejection) (Estado de Mexico 2005, p. 47). The EIA is designed "to identify, predict, interpret, and evaluate the impact on the environment, human health and welfare, of works and activities of public or private nature that can cause an ecologic misbalance and also to identify **prevention, mitigation** and **compensation measures** caused by them. Likewise, in terms of activities considered as risky, it is necessary to attach to the environmental impact study a preliminary report on risk, in order to be informed about the mitigation measures to be taken in case of contingency" (Hosein 2007: 41). Projects are classified into three categories with the following respective instruments:

- Requiring a regional EIA,
- Requiring a specific EIA,
- Only requiring a Preventive Report (Informe Preventivo IP) (World Bank n.d.).

In national protected areas a **resource management plan**, which must be designed with the active participation of local communities, restricts activities in the buffer and transitional zones of biosphere reserves. This plan includes conservation and infrastructure projects, as well as productive and scientific and social development projects related to housing and municipal services (Nadal 2001: 7).

Valuation of biodiversity and impacts

To support the equitable sharing of costs and benefits of the protection and use of biological diversity, present (actual) and potential environmental, social, cultural and economic contributions are considered in a valuation process (CONABIO 2000: 37). According to Art. 5.20 of the Biodiversity Code, SEMARNAT develops and promotes criteria, methodologies and procedures to place a value on biological diversity and environmental services, thereby attempting to harmonise the conservation of wildlife and its habitat with the sustainable use of goods and services. This can be managed through:

- **Certification systems** for the production of environmental goods and services,
- Studies that consider the diverse cultural, social, economic and ecological values of biodiversity,
- Studies that evaluate and internalise environmental costs related to the use of environmental goods and services,
- Compensation mechanisms and **economic instruments** to remunerate local inhabitants, in terms of costs associated with the conservation of biological diversity and maintenance of the flow of environmental goods and services, and
- Utilisation of compensatory mechanisms and **international contributing instruments** (Estado de Mexico 2005: 168).

The **economic value of natural resources** is considered to be the key to their efficient management (Estado de Mexico 2005: 2). The economic valuation of natural resources can be defined as an attempt to assign a quantitative and monetary value to goods and services related to resources or environmental systems (Estado de Mexico 2005: 2). In this context, the National Biodiversity Strategy establishes the valuation of biodiversity as one of its four strategic lines, with the following priority actions:

- Assessment and valuation of the contribution and use of biodiversity
- Economic analysis of the costs and benefits of biodiversity protection and conservation, and
- Valuation of the costs of biodiversity loss related to projects (CONABIO 2000: 39).

The value is determined according to the willingness to pay for a food or service, i.e. it depends on the positive or negative perception that an ecosystem has for the well-being of the population (Estado de Mexico 2005: 3). Therefore the economic total value (Valor Económico Total VET) is made up of a number of values:

- The direct use value (Valor de uso directo VUD), which is the benefit obtained when exploiting natural resources via a specific project.
- The indirect use value (Valor de uso indirecto VUI), which relates to the functional values of ecosystems such as carbon capture or the filtration of water (environmental services).
- The optional value (Valor de Opción VO), which refers to the value that has to be paid to conserve natural resources for future use.
- The quasi-optional value (Valor de Cuasi Opción VCO), which is the potential value of natural resources (assigned to the preservation of the use option).
- The value of existence (Valor de Existencia VE), which is the value assigned to a natural good, which is perceived by people who do not intend to use it. Examples include cultural, religious and ethical values.
- The heritage value (Valor de Legado VL), which describes the value of natural resources for future generations (Estado de Mexico 2005: 37f).

Environmental Audits

Environmental audits are additional instruments that support voluntary compliance measures. They are aimed at:

- Assessing the environmental management of audited businesses,
- Assessing the degree of compliance by audited businesses with environmental laws and regulations,
- Assessing the degree of compliance by audited businesses with their own environmental policies and with the policies and guidelines set for their sector,
- Assessing the practices and procedures relating to the management and maintenance of facilities, and
- Developing an action plan to remedy those deficiencies uncovered during audits (Commission For Environmental Cooperation 1998: 120).

An environmental audit proceeds through three stages: planning or pre-audit, “in-situ” assessment or audit and post-audit (Commission for Environmental Cooperation 1998: 122) and is formally agreed between the environmental authority and the audited business through:

- The Working Agreement, under whose terms the audit is launched and by which the involved party commits itself to abide by the audit results, and
- The Environmental Compliance Agreement, subscribed to at the end of the audit and prescribing the appropriate preventive and remedial programmes to be implemented by the audited party (Commission For Environmental Cooperation 1998: 118f).

Concerns of indigenous people

The concerns of indigenous people must always be considered. The General Law for the Sustainable Forest Development (Ley General de Desarrollo Forestal Sustentable), the General Wildlife Law (Ley General de Vida Silvestre) and the Law for Sustainable Rural Development (Ley de Desarrollo Rural Sustentable) contain provisions on this issue. Indigenous people should be consulted independent of the communal land structure prior to any development permits, including logging, mining, mineral exploration, road building, or any other form of construction (Miller 2001: 36).

6.5.4 Determining significance and thresholds

The significance of potential impacts or hazards of projects, works or activities is identified through EIA and risk assessment (CBD 2006: 156f).

When an EIA is undertaken, the environmental baseline must first be defined. To decide on the legitimacy and the approval of the proposed project the following questions have to be considered (Grupo Mall 2007: 5):

- Does the project modify the natural dynamics of any body of water?
- Does the project modify the natural dynamics of flora and fauna populations?
- Does the project modify the visual appearance of the landscape?
- Does the project isolate or unify population units?
- Does the project modify the topography of the implantation area?

In natural protected areas, human activities are reduced to a minimum, i.e. restrictions are made with respect to the authorisation of projects in these areas if they may cause significant impacts on the environment. Nevertheless, if the ANP are lacking a well defined (and accepted) resource management plan, they are put at risk of being transformed into “open access resources” (Nadal 2001: 7).

6.5.5 Mitigation hierarchy

The Civil code stipulates in Art. 30 that the reparation of environmental damage includes the following measures:

- I. **Restitution** of the damaged good or a **payment**, if restitution is not possible,
- II. **Indemnification** for the resulting material and immaterial (moral) damage, including payments for the consequences such as the recovery of health, and
- III. **Recompense** for all caused damage (González 1996: 419).

In addition, the Biodiversity Code requires that the environmental authorities ensure that negative impacts of projects on wildlife and habitats are avoided, prevented, repaired, compensated or minimised (Estado de Mexico 2005: 167f). The following measures are defined:

- **Preservation** (preservación): all political processes, measures and actions to conserve and protect the conditions that favour the evolution and continuity of ecosystems and natural habitats,
- **Rehabilitation** (rehabilitación): actions to revert an area to its original environmental functions,
- **Remediation** (remediación): measures to correct, eliminate or reduce pollutants to a level that is safe for health, the environment and biodiversity (synonymous with the reparation of environmental damage),
- **In-kind reparation** (reparación en especie): the restitution of chemical, physical or biological conditions of flora and fauna, landscape, soil, subsoil, water, air and the structure or functions of ecosystems to their status before the environmental damage, and
- **Restoration** (restauración): activities for the recuperation and reestablishment of conditions that favour the evolution and continuity of natural processes (Estado de Mexico 2005: 26).

In 2003 CONABIO established the **Program for Environmental Restoration and Compensation** (Programa de Restauración y Compensación Ambiental), which aims to restore or recover ecosystems and natural resources that have been damaged or degraded by various causes (CBD 2006: 156). If **recovery** or **compensation** are impossible, **measures to avoid or mitigate damage elsewhere** are applied (CBD 2006: 156). This is done through support of relevant projects and programmes, in accordance with the general priorities of the programme (Líneas Temáticas y Prioridades generales) (CBD 2006: 156).

In the course of the EIA the mitigation hierarchy is applied, which seeks to identify preventive, mitigation and compensation measures to address impacts caused by works and activities of a public or private nature (Hosein 2007: 6). This includes considering alternatives. According to the LGEEPA the environmental report must contain a description of **preventive** and **mitigation** measures (Secretaría de ordenación del medio ambiente 2007: 9). The latter are defined as the totality of actions that the project promoter has to implement to **mitigate** the negative impacts and to **reestablish** the environmental conditions that existed prior to the project, or to **compensate** for the impacts (Secretaría de ordenación del medio ambiente 2007: 2). These mitigation and compensation measures are laid down in the **Environmental Management Plan** (plan de manejo ambiental) and are linked to the environ-

mental impacts that occur during the different steps of project implementation (Secretaría de Desarrollo Social y Medio Ambiente 2008: 9). The Environmental Management Plan contains:

- A **mitigation programme**, including mechanisms and actions to minimise the negative environmental impacts during construction, operation and closure of projects,
- A **compensation programme**, including compensation measures to reconstitute the environment (e.g. reforestation programmes), and
- A **follow up programme** to verify the environmental performance of the project (Secretaría de Desarrollo Social y Medio Ambiente 2008: 9f).

6.5.6 Determining offset demand/compensation measures

Article 2.306 of the Biodiversity Code stipulates that when **in-situ reparation** of environmental deterioration is impossible, it will instead be subject to **indemnification** (Estado de Mexico 2005: 102). Once the indemnification for environmental deterioration is determined, the amount is transferred to the **Biodiversity Restoration and Preservation Fund** (Fondo para la Restauración y Preservación de la Biodiversidad) (Estado de Mexico 2005: 102). The economic valuation of the indemnity (in monetary terms) can be done either by the Ministry, the Environmental Protection Administration (Procuraduría de Protección al Ambiente del Estado de México), qualified experts, educational institutions or research institutions (Estado de Mexico 2005: 102).

Typical compensation measures can include the following:

- Improvement of water, air and soil, through the application of environmental technologies to prevent and reduce negative impacts,
- Augmentation of vegetation cover through compensation, in order to reforest or conserve forests, shrubs, mangroves etc.,
- Respect for and protection of natural protected areas,
- Recovery and recuperation of species that are threatened, and
- Preventive measures to avoid impacts on endemic populations (CBD 2006: 158).

6.5.7 Implementation and responsibilities

Environmental liability

Under civil law, juridical persons are liable for damages caused by their legal representatives in the fulfilment of their duties. Should these circumstances arise, such persons would have to redress the damages so caused (Commission for Environmental Cooperation 1998: 127). In this respect, Art. 1.917 of the Civil Code (Código Civil Federal) stipulates that individuals who have caused damage are responsible for the reparation of the former, in accordance with the Code's provisions (González 1996: 417). In this context, Art. 5.91 of the Biodiversity Code defines the obligation that any person causing damage to wildlife or habitat must repair these in accordance with the Code's provisions and regulations (Estado de Mexico 2005: 182). The reparation of damage comprises the reestablishment of the conditions prior to the impact, and if this is impossible, the payment of an indemnity, which is used to support the development of programmes, projects and activities to restore, conserve and recover species and populations and monitor in accordance with regulations (Art. 5.93; Estado de Mexico 2005: 182). Similar to the provisions in the Biodiversity Code, the LGEEPA establishes **responsibility for the repair of damages resulting from contamination or deterioration** of the environment or any

impairment of natural resources or biodiversity (CBD 2006: 156). The principle of responsibility for environmental damage not only aims to oblige the polluter to repair resulting damage, but also to prevent and avoid future impairments (Estado de Mexico 2005: 13). The Biodiversity Code distinguishes between two environmental impact concepts. On the one hand, the concept of **environmental deterioration** (deterioro ambiental) refers to the impairments to the environment and biological diversity in the proper sense. And on the other hand the concept of **environmental damage** (daño ambiental) refers to impacts on the goods, health and well-being of humans (Estado de Mexico 2005: 13, 23).

Environmental securities and funds

The LGEEPA foresees the **payment of economic guarantees** (environmental insurances and guarantees) for projects for which significant environmental impacts have been identified, in order to ensure the protection of environmental components or reparation of damage (CBD 2006: 156).

In the field of EIA, under Art. 2.308 of the Biodiversity Code, the Ministry of the Environment is able to demand insurance or guarantees with respect to the fulfilment of conditions established in the authorisation (for case when work may cause serious damage to ecosystems or their components). This includes the cost of preventive measures and other necessary measures to avoid and to reduce to a minimum negative effects on the environment (Estado de Mexico 2005: 103). Furthermore, the Biodiversity Code stipulates the creation of a **Fund for the Restoration and Preservation of Biodiversity** (Fondo para la Restauración y Preservación de la Biodiversidad), which serves as complementary financial support, in case the scope of damage reparation is such that it can be neither covered by the aforementioned insurance or by the proponent (Estado de Mexico 2005: 14).

Another Fund is the **Fund for the Reparation of Environmental Deterioration** (Fondo para la Reparación del Deterioro Ambiental).

6.5.8 Critical discussion

As in Argentina and Brazil the federal organisation of the Mexican republic may complicate the implementation of legal provisions and subsequent inspections.

In Mexico, both the Biodiversity Code and the General Act on Ecological Equilibrium and Environmental Protection contain provisions on Environmental Impact Assessment and impact mitigation. However, **the relation of these two laws is not clearly visible**, i.e. how they interact and what the specific focus of each is.

The LGEEPA especially encourages voluntary compliance measures, in particular the completion of environmental audits. This **combination of mandatory impact mitigation, EIA, and voluntary impact mitigation, audits**, is a strength of Mexican impact mitigation and has to be considered progressive. Nevertheless, the voluntary character is at the same time a weakness because its broad application cannot be guaranteed.

Regarding Environmental Impact Assessment **no general guidelines** could be identified **with respect to the components and criteria, the methods for impact evaluation and the determination and elaboration of mitigation and compensation measures**. According to Art. 5.20 of the Biodiversity Code, SEMARNAT develops and promotes criteria, methodologies and procedures to value biological diversity and environmental services, but tangible examples were not identified within the scope of the study. Thus, it remains unclear as to what extent the mentioned guidance is actually available.

In the course of the EIA the mitigation hierarchy is applied and measures are laid down in the Environmental Management Plan. The EMP is a strength of the Mexican EIA. It includes a mitigation pro-

gramme, a compensation programme and a follow up programme and the respective measures. Here, special attention must be paid to the **distinction between a separate mitigation and a compensation programme**. It is particularly important that the **follow up is an integral part of the EIA process** and therefore contribute to ensuring the proper implementation of measures and their long-term effectiveness.

The **principle of responsibility for environmental damages** (as dictated by the Biodiversity Code) aims not only to oblige the polluter to repair resulting damage, but also to prevent and avoid future impairments. The principle may be considered an appropriate means of halting biodiversity loss, as it promotes an extensive responsibility that goes beyond the direct and immediate impacts of activities. However, **no provisions are made for implementation of this principle**. In practice, it is indeed rather difficult to foresee future impacts and to assign the responsibility to a specific polluter.

Another strength is the **payment of environmental securities** that is stipulated by the LGEEPA and the Biodiversity Code. The latter empowers the Ministry of the Environment to demand insurance or guarantees to ensure the fulfilment of conditions established in the authorisation. Nevertheless, it remains **unclear how this works in detail and whether this is only applied in exceptional cases or whether it is current practice**.

Likewise, different funds are established by the law, but how these work, what procedures are applied and the interrelations between them is not specified.

6.6 Selected aspects of impact mitigation regulation in South Korea (Republic of Korea)

6.6.1 Environmental Assessment Instruments in Korea

The **Environmental Impact Assessment (EIA)** was introduced in South Korea with the enactment of the '**Environmental Conservation Act**' in 1977 and was titled 'prior consultations'. Because of the lack of detailed regulations, substantive implementation of the EIA system was delayed until 1981, when '**Regulations on preparing the EIA Report**' were legislated.

The '**Framework Act on Environmental Policy (FAEP)**' was enacted as a substitute for the 'Environmental Conservation Act' in 1990 and it provided the legal basis for EIA until the 'Environmental Impact Assessment Act (EIA Act)' was enacted in 1993 as an independent law. Since 1999, the '**Impact Assessment Act on Environment, Transportation and Natural Disasters (Integrated IA Act)**' has regulated EIAs. The Integrated IA Act was enacted to integrate impact assessments on the environment, population, transportation and disasters. The environmental impact of 17 development project categories comprising 62 types of development project is currently evaluated by EIA.

Although the EIA system has proved an effective programme for protecting the environment as well as promoting the importance of environmental conservation to the public over the past 30 years, inherent limitations of EIA have been exposed. These include difficulties in establishing alternatives and altering the project boundary (Song 2006). These difficulties were caused by the EIA being primarily applied to large-scale development projects during the implementation stage, after plans have been approved and confirmed.

In order to overcome the difficulties, a **Prior Environmental Review System (PERS)** was introduced in 1993. This assesses the environmental effects of administrative plans and development projects in the early stages of the decision making process in South Korea. Since 1994, it has been a requirement to evaluate the environmental impact of administrative plans which do not have a legal basis, and medium or small-scale public development projects in conservation areas. When FAEP was amended in 1999, PERS was implemented as a legally-binding system.

However, PERS had a few remaining problems: First, it was applied to a very limited number of plans and programmes. Second, it was hard to reflect the PERS's results in the plan, since the PERS was normally conducted almost at the end of the planning process. Third, regulation of the implementation of results is lacking. Fourth, because the PERS procedures do not require mandatory public consultation (only consultation with the relevant authorities), the general public cannot participate in the planning process for higher level plans.

In order to address the problems noted above and to implement **SEA** in South Korea by enhancing the objectivity and expertise of the PERS, FAEP (the legal basis for PERS) was amended in 2004. The amended FAEP came into effect in June 2006 in order to evaluate the environmental effects of policies, plans and programmes which affect the initiation of development projects (Park et al. 2004).

6.6.2 Compensation and mitigation in South Korea

EIA and PERS are the two main instruments for mitigating the negative effects of development projects on natural ecosystems. For example, building environment-friendly dams was discussed during the process of EIA consulting on dam constructions in the 1990s. Accordingly, mitigation measures such as creating wildlife corridors, artificial wetlands and fish bypass systems in dams were applied. In

the 2000s, in addition to building such mitigation facilities, the creation of artificial river was attempted downstream of a dam (Ministry of Environment and Korea Environment Institute 2006, see Box below).

Box: Case Study Hantan River

The Hantan River has a beautiful natural landscape and serves as a habitat for diverse wildlife species. Hence, a huge ecological impact was anticipated if the river was disconnected by a dam. However, the area around this river and its downstream is also vulnerable to floods due to its topographical features and action was required in order to prevent flood damage. Given these conditions, controversy that pitted development against conservation flared up during the EIA process, escalating into a social conflict.

Following consultation as part of the EIA in 2003, the construction of an open-style dam was proposed as mitigation measure. An open-style dam builds floodgates at the lower part of the main dam to assure the same river flow as before the dam construction during non-flooding periods, while the floodgates are closed during periods of potential flooding to utilise the dam's water-holding function (Ministry of Environment and Korea Environment Institute 2006).

Furthermore research was undertaken on the transplantation of vegetation structures (especially trees in good condition) to mitigate environmental impacts from settlement development projects. Not only the vegetation but also the soil was carried to the transplantation areas (where it was used to create a growing medium for the transplanted trees) (Han et al. 2004).

Related to impact mitigation regulation (IMR), the conservation of natural ecosystems and restoration of damaged ecosystems is mentioned in higher laws such as the **Fundamental Act of National Land (FANL)**. However, lower laws do not reflect the intention of higher laws. Development-related laws focus on post-restoration of the environment damaged by development. Like the development-related laws, laws dealing with environmental conservation plans also focus on post-restoration rather than on prevention of environmental damage. In addition, it is difficult to compensate for the impacts by impact mitigation regulation because there are no regulatory provisions (Choi 2007).

In Korea, the **Wetland Conservation Act (WCA)**, enacted in 1999) and other wetland-related acts do not include the "no net loss principle". Although the WCA considers the establishment of offsetting wetlands during implementation of development projects in wetlands conservation areas (Article 17 of WCA), it is only a recommendation, not legally binding (Article 18 of WCA) (Bang 2006).

In recent years, the implementation of impact mitigation regulation has actively been discussed in the Republic of Korea, as has the implementation of the "no net loss principle" based on impacts in natural ecosystems (e.g. Han 2007, Choi 2007, 2008). Choi (2008) suggests ways to compensate and recover the value of damaged natural ecosystems by (i) applying an ecological planning method to prevent and mitigate environmental damage caused by urban development and (ii) applying impact mitigation regulations to compensate unavoidable environmental damage. The research area is Seo-chang Second District in Incheon Metropolitan City, where a housing development project was begun.

In order to find a suitable compensation model for South Korea (in particular an evaluation method to determine the extent of compensation), four models were investigated: the verbal argumentative model, the biotope value model, the compensation factor model and the restoration cost model. The merits, demerits and limitations of each model were analysed. In practice only measures to avoid and minimise environmental impacts were realised. Compensation and replacement measures were investigated theoretically.

Under contract to the Korean Ministry of Environment (MOE), another research project on this topic has recently finished (Choi et al. 2007). In this research, various types of compensation tools from

around the world were examined to assess which are most suitable for application in South Korea: no net loss of wetlands (Wetland Mitigation, USA), German Impact Mitigation Regulation (“Eingriffsregelung”) and no net loss of green space (an approach being developed in Japan, but not yet implemented by law).

In conclusion the research suggests the following principles:

- The German tool “Eingriffsregelung” has different steps in the systematic decision-making process, such as avoidance / minimisation, restoration compensation, replacement compensation and, as a last step, financial compensation. Hence, the German “Eingriffsregelung” is mostly recommended as the compensation tool that will be applied in South Korea.
- The proposed Japanese compensation tool addresses only green spaces. No net loss of green space means not only the quantity of green spaces, but also their quality and functions (i.e. keeping both the total amount of green space and its functions).
- The application will be possible by amending current laws. The National Environmental Policy Act and the Natural Environment Preservation Act are best suited for amending provisions.

It was also suggested which matters should be discussed further:

- Development of suitable and reasonable criteria and methods to quantitatively and qualitatively analyse the total amount of green spaces and their functions,
- Selection of available databases, for example, biotope maps or environmental conservation value assessment maps,
- Implementation of pilot projects.

In February 2008 Lee Myung-bak was elected as the new South Korean President. One of his goals is to push the development and building sector, so that environmental issues will possibly have a reduced status.

6.7 Selected aspects of impact mitigation regulation in China

In the 1970s and 1980s China created many environmental policies specific to the Chinese context, particularly in the fields of pollution prevention and control, implementing the precautionary principle, the “polluter pays principle” and strengthening environmental management. Since the 1990s China has advanced a strategic policy of treating pollution control and ecological conservation equally and with due consideration given to the requirements for biodiversity conservation. The **Environmental Protection Agency** developed a series of policies for nature conservation based upon past experience in pollution prevention and control. One of these is the policy for **Nature Conservation Management**:

The precautionary principle

Preventive measures are adopted in order **to avoid or reduce** the pollution or **damage to the environment** as far as possible. To accomplish this, nature conservation will be included as part of the annual economic and social development plan. Governments at all levels and relevant departments will adopt responsibility for nature conservation goals. For those **projects related to natural resources exploitation, an Environmental Impact Assessment must be undertaken.**

The policy encompasses the principles that whoever exploits will protect, whoever damages will restore and whoever utilises will compensate the environment.

For construction projects, the environmental management will be synchronised with the design, construction and operation of the main engineering activities, i.e. measures should be adopted to protect the environment while undertaking economic activities. The **ecological damage resulting from natural resource exploitation will be addressed within a given time** and a levy system adopted for exploitation and utilisation of biological resources (Ministry of Environmental Protection of the People's Republic of China n.d.).

Strategy and Action Plan for Nature Conservation

To implement the strategy of sustainable development, the CBD, the “Ten-point Policy for Environment and Development” and China's Agenda 21, the Chinese **National Environment Protection Agency NEPA** developed in 1994 “**China's Agenda 21 for Environmental Protection**”.

This document reviewed past development, analysed current problems and proposed the goal and action plan for the 1990s and early years of the 21st century from the aspects of policy directives, legal construction, institution building, environmental education and publicity, nature conservation, urban and rural environment protection, industrial pollution prevention and control, environmental monitoring, environmental science and technology and international cooperation and exchange in the field of environment. It will be used as a guide for future environmental protection in China (Environmental Department n.d.).

In Chapter 16 of China's Agenda 21 for Environmental Protection, the background section states that for the time being the requirement for EIA is applied only to projects in the fields of water resources, hydrological facilities and exploitation of mineral resources, but not to construction or exploitation activities related to forest, land and tourism resources. Consequently, methods, policy changes and actions have been proposed to improve the EIA scope.

In terms of legal construction, **it is imperative that the rule of environmental management for exploitation of natural resources and the method of ecological compensation for resource exploitation activities are established.** The responsibilities of the environmental department and resource

exploitation department should be clarified through legislation and EIAs undertaken for agricultural, forest, mineral and water resource development activities. **The rule of ecological compensation for resource exploitation should be adopted.** These were objectives set out in the “Strategy and Action Plan for Nature Conservation” for the end of the 20th century and early 21st century that take into consideration the current ecological, natural resource and environmental management context. As an “Action Program” the following was pointed out:

- To strengthen the enforcement of relevant laws and regulations and the management of natural resources,
- To improve the application of EIA in the approval of resource exploitation activities,
- **To identify financial resources from resource exploitation and utilisation for ecological recovery through legal instruments, including compensation for ecology, fund guarantees, penalties for ecological damage, etc.**

Implementation of EIA law

In 2002 China enacted the Law on Environmental Impact Assessment, which requires the environmental impact that may be caused by the implementation of planning and construction projects be analysed, predicted and assessed. It also requires that **countermeasures and measures preventing or mitigating adverse environmental impacts**, and methods and systems for tracking and monitoring **are put forward**.

6.7.1 Compensation and its different meanings in China

In the last few years several articles have been published in Chinese journals on the theme of “ecological compensation”. These represent and inform about the current discussion about this issue in China. Some publications address theoretical aspects of **“Eco-environment Compensation”** (Yan and Wu 2005) and “ecological compensation mechanisms” (Wang; Wan and Zhang 2007). Others deal with construction or development projects such as highways and roads (Luo Shu et al. 2000), hydropower construction (Dong, Hong and Ye 2005) or regional land consolidation (reallocation of land) (Yu et al. 2006).

While Dong, Hong and Ye discuss “Ecological Environment Compensation” partly as a “social compensation” for impacted people in the project area (i.e. they take priority for jobs in the newly constructed hydropower stations of Siluodu and Xiangjiaba or financial compensation to those negatively impacted by the project), Yu et al. (2006) list a broad range of mitigation measures, mainly avoiding and minimising the environmental impacts of regional land consolidation as “compensation measures”.

Yan and Wu (2005) analysed the relationship between ecological sustainable development and “eco - environment compensation”. They called for the establishment of an improved “system of eco-environment compensation” in order to protect the environment, resolve environmental issues and promote ecological sustainable development in China using a number of measures:

- Strengthening of the legislative framework for mechanisms of eco-environment compensation, with clearly defined compensation standards,
- Implementing an “eco-environment compensation” tax and the establishment of a national environmental protection fund to promote ecological sustainable development,
- Strengthening research on this topic,

- Enhancing the transfer of financial payments for environmental protection and compensation,
- Establishing national and provincial demonstration areas (key projects),
- Raising of fees for emissions (Yan and Wu 2005).

Wang, Wan and Zhang (2007) discussed five different meanings for the term **ecological compensation** in China:

- 1) Fees for the use of ecological services (e.g. as “compensation” for a city's main water source),
- 2) **Natural compensation for the ecological environment (e.g. ecologically important sites should be replaced at other sites),**
- 3) Use of economic means to control behaviour that undermines the ecological environment,
- 4) Compensation payments to an individual or a region that protects the ecological environment or that has given up potential development opportunities,
- 5) Compensation payments for the additional cost or investment in protection measures, payable to an individual or a region.

In conclusion there are two sorts of ecological compensation in China. One is based on payments for environmental services while the other is based on the “**polluter pays principle**”. Up until recently, ecological compensation was primarily used in the economic sense. From the perspective of public policy formulation, the goals of eco-compensation are to protect ecosystem functions, support the sustainable use of resources and promote harmony between man and nature. Based on the service value of ecosystems, the cost of eco-protection, the cost of eco-damage and the cost of development opportunities regulate the relationship between the economic interests of the ‘eco-protector’, the beneficiary and the ‘eco-destroyer’, by the economic means of finance, fees, taxes and market (Wang, Wan and Zhang 2007). At present, eco-compensation is a governmental instrument of fiscal transfer payments for ecosystem services programmes. The most important in China and also the largest programme in the developing world (Bennett; Mehta and Xu 2008) is China’s Sloping Land Conversion Program (SLCP) (see box below).

Box: China’s Sloping Land Conversion Program (SLCP)

China is currently attempting to dramatically alter its rural land use patterns in response to growing environmental pressures. The SLCP subsidises rural households who convert sloping and marginal cropland to forests or grassland, operating through a mix of command-and-control and incentive-based measures. It was introduced in late 1999 (Bennett; Mehta and Xu 2008).

Reportedly, up to 6 million hectares of farmland in China lie on slopes over 25°. The new policy requires the conversion of all farmland on slopes exceeding 25° to forest or grassland. The main goal is to reduce soil erosion and runoff and increase forest cover on marginal land. The policy is not new – as early as the 1960s farmers had been required to convert sloped land in some areas. Unlike previous bans on swidden and sloped farmland cultivation, however, these measures now come with regulations for implementation and with significant financial support (Weyerhäuser et al. 2005). Weyerhäuser et al. argue that as well-intentioned as this and other similar programmes are, they fail to accomplish the envisaged goal of mitigating erosion and surface flow in upper watersheds and subsequently do not have the targeted positive impact in flood plains or with respect to preventing floods. In addition their research highlights some of the programme’s negative impacts on the livelihoods of mountain communities, their environment and overall agro-biodiversity.

There are also other fiscal or economic instruments in use, such as “ecological compensation fees” for different project categories (mining, land development, tourism development, natural resources,

medical plants and electric power projects) or trading of emission and water use rights (Wang, Wan and Zhang 2007). The main problems that have occurred with these in practice are:

- The legal regulations are not well constructed,
- The relatively rare use of market mechanisms to carry out eco-compensation,
- Government weakness,
- Lack of public participation.

The authors made five suggestions for establishing “**ecological compensation mechanisms**”:

- 1) Improvement of the system of fiscal payment transfer (e.g. coordination and integration of special funds with priority for the protection of water resources, soil and water conservation, biodiversity conservation, etc.);
- 2) Establishment of an eco-friendly tax system;
- 3) Establishment of an ecological compensation policy (increasing the fiscal payment transfers for ecological construction and environmental protection projects);
- 4) Internalisation of eco-environmental costs;
- 5) Establishment of a valley ecological compensation system (that includes compensation payments paid from upriver to downriver regions in cases where agreement regarding water quality and quantity are not reached).

Strengthening of the “polluter pays principle” and the natural compensation of impacts in the environment were not suggested by the authors.

In fact, in practice there is such compensation (see the Binhai highway case study below) and in current eco-planning projects, based on ecological capital evaluation of the region, environmental offset measures are to be suggested according to the local conditions of the project area. "Eco-planning projects" are a type of formal planning category that are established by the local government or environmental protection bureau. It not only focuses on some typical ecological parameters, but on integrated planning for the total ecological environment of a planning region, which is the basics for local sustainable development (Yun 2008).

6.7.2 Case Study: The Binhai Highway project – environmental impacts and its mitigation (Luo et al. 2000)

The Binhai Highway lies in the Shenzhen Bay. It originates on the west side of the Guangshen Highway and follows the Shenzhen Bay to the west (see Figures 37 and 38). On its way, it passes by a mangrove reservation, goes through Huaqiao landscape area, a reclamation area in Shenzhen Bay as well as a hi-tech industry area. The total length is 9.66 km, of which 7.6 km are constructed on the embankment of a large-scale reclamation in the north of Shenzhen Bay. The total area of the road is near 900,000 square meters, of which 610,000 square meters are in the reclamation area. The largest road width is 138 meters. The Binhai Highway is also known as the green promenade in the western sea. It has a green area of 965,000 square meters, which possesses more than 200 kinds of plants. Of all the highways in Shenzhen, Binhai Highway has the highest density of overpasses. There are eight overpasses and several pedestrian overpasses, a seawall project, eco-environmental protection project and monitoring projects. The ecological park in Binhai highway project has an area of 140,000 square meters, which includes off-profile roads, blind roads, the sound barriers as well as a viewing platform with an area of 20,000 square meters and 21 meters high.



Figure 37: Location of the Binhai Highway project

The construction of the highway caused several impacts on the environment:

- Destruction of the original geological and geomorphologic conditions, vegetation, soil and agro-ecosystem;
- Reclamation projects that changed the structure of the coast, and impacted the tide range, currents and waves;
- Changes to the existing biological structure, directly impacting the wetland on the Shenzhen River estuary, the aquaculture farms (oyster beds) on the Shenzhen Bay tideland and the intertidal mud-flat;
- Changes to soil erosion and water temperature;
- Changes to local climate and terrain features (including sedimentation and erosion);
- Reducing the area of mangrove reservation, generating threats to species diversity;
- Fragmentation effects.

The pollution caused by road traffic is linear, mobile with a tendency to diffuse. Its impact is broad, including air pollution, noise, road surface pollution and water pollution.



Figure 38: Binhai Highway and Shenzhen Bay

Measures to mitigate and compensate the impacts of the project

Every step of Binhai Highway project has been accompanied by an EIA report in which numerous mitigation measures and some compensation measures were noted.

- To reduce the decrease of biodiversity and the diversity of landscape, habitats should be retained in the key areas **or reasonable corridors should be built between different habitats.**
- More bridges, tunnels, nature reserves and corridors should be built relative to 'usual' road construction, in order to reduce migration barriers and to protect habitats.
- Most of the Binhai Highway is 100 meters wide. However, a section that passes by the mangrove area has been narrowed to 40 meters and screened off by sound barriers.
- The reclamation area of Binhai Highway project abuts the south of Fairview Park. **Some reserved land for vegetation reconstruction and a water area of more than 30 million square meters remains.** The area is connected by a creek to the sea.
- A special aspect is the protection of the mangrove reservation. To minimise the impact on the mangrove reservation the road was moved to the north and narrowed in order to expand the beach and to enlarge the mangrove reservation. **Money was also spent on planting mangrove.** The reservation is a part of the Neilingding Island-Futian National Nature Reserve, and also a part of Shenzhen Bay Wetland. It is an important stopover and habitat in the north-south migration of birds in the eastern hemisphere (see Figure 39).



Figure 39: Futian Mangrove Reserve

Source: Peking University and UNEP 2007.

- Furthermore the use of ecological construction technology was required, research on the technology of protecting biodiversity within the domain of the road was improved and aspects of good landscape design were also taken into account.

7 Comparative analysis of selected aspects of impact mitigation regulation

7.1 Scope and objectives

After being opened for signature at the United Nations Conference on Environment and Development 1992 in Rio, the Convention on Biological Diversity (CBD) finally entered into force in December 2003. Its objectives were recognised worldwide: “the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources” (Art. 1 CBD). Since then, awareness of the dramatic and ongoing biodiversity loss has been raised, and the CBD and its contracting parties have promoted conservation and restoration actions and projects.



Figure 40: Biodiversity Hotspots

Source: Conservation International: Biodiversity Hotspots. Available at:
<http://www.biodiversityhotspots.org/xp/hotspots/Pages/default.aspx>. Accessed: 21.10.2008.

The studied countries have a high importance in terms of biological diversity: Brazil, Madagascar, Mexico and China are among the world's 17 megadiverse countries¹¹ and most of the studied countries host at least one of the world's biological hotspots (see Figure 40):

- Atlantic Forest (Brazil, Argentina),

¹¹ This group of countries has less than 10% of the global surface, but support more than 70% of the biological diversity on earth (Australian Government. Department of the Environment, Water, Heritage and the Arts: Biodiversity Hotspots. Available at: <http://www.environment.gov.au/biodiversity/hotspots/index.html>. Accessed: 21.10.2008).

- Cerrado (Brazil),
- Mediterranean Basin (Egypt),
- Mesoamerica (Mexico),
- Madagascar and the Indian Ocean Islands,
- Mountains of southwest China.

The desire for mitigation of impacts on biological diversity and natural resources is growing. Whereas countries such as Brazil have gathered experience and knowledge on environmental politics and legislation for decades (and are currently promoting numerous projects that aim to strengthen biological diversity - see Table 3), other countries such as Madagascar have only relatively recently realised the importance of these issues.

There are some particular aspects of the studied countries that have to be considered. The three Latin American countries Argentina, Brazil and Mexico cover large territories (among the fifteen largest countries of the world) and share a federally organised political and administrative structure. This implies a division of power between the national and state / provincial authorities, possibly resulting in failures due to a lack of distinction between competencies. Furthermore, in particular, the supervision and inspection of the implementation of general environmental principles and impact mitigation principles is complicated and less transparent due to the division of powers and the large areas involved. This also leads to huge differences between the states. Furthermore, some regions in the Brazilian Amazon forest are hardly accessible.

Another obstacle, which has been specifically reported for Madagascar, is the lack of awareness amongst (some parts of) the population with respect to the necessity of biodiversity conservation and restoration actions. This correlates with the traditional land use practices of the poor rural population. Deforestation for wood and agricultural use represents an enormous threat to biodiversity in several of the studied countries, and this is not covered by any impact mitigation regulation.

In all of the studied countries the basis for impact mitigation is laid down in the environmental legislation. Usually, a general environmental act exists at a federal level, sometimes complemented by a specific biodiversity code (see Table 18).

Table 18: Environmental laws related to environmental compensation in the studied countries

Country	Environmental laws
Argentina*	Environmental Framework Law
Brazil*	National Environmental Policy Act, National Biodiversity Policy
Egypt	Law 4/1994 for the Environment
Madagascar	Malagasy Environmental Charter
Mexico*	General Act on Ecological Equilibrium and Environmental Protection, Biodiversity Code
* The environmental laws at federal level are complemented by laws, decrees and directives at state / provincial and / or municipal level.	

The liability for environmental impacts is normally formulated under these laws ("polluter pays principle"). Furthermore the requirements for EIA and the relevant procedure are also specified.

Brazil has an advanced position, with a long tradition of environmental legislation. It has developed more specific laws, in particular the Forest Code and the SNUC Act, to which the country's two man-

andatory compensation approaches are related. Furthermore, during the last decade Brazil has initiated and implemented numerous programmes and projects aimed at the conservation of biological diversity and the sustainable use of its natural resources, including those related to compensation. However, even though Brazil has a very advanced political agenda and related legislation, the country faces a number of problems. Of these, the most serious problem is the enforcement and proper implementation of these approaches (Inhetvin 2008). Law enforcement is a general problem that has been encountered in several other countries, e.g. Argentina and Egypt. In Egypt, the legal context for impact mitigation remains weak and economic development objectives take priority in some cases (Ministry of State for Environmental Affairs 1994: 45).

With respect to the legal context and practical implementation, biodiversity concerns require two basic principles to be applied: a conservation approach and a restoration approach, both of which are laid down in law as complements to one another¹². When dealing with impact mitigation it is evident that restoration actions and conservation actions should be examined. The latter is an expression of the precautionary principle. In all the countries studied, this is a major focus of environmental politics, implemented through statutory instruments and tangible projects. The instruments include:

- The National Biodiversity Strategy in Argentina,
- The National Biodiversity Policy and the National Biodiversity Targets for 2010 in Brazil,
- The National Biodiversity Strategy and Action Plan in Egypt,
- The Durban Vision “Madagascar Naturally” and the Madagascar Action Plan, and
- The Biodiversity Code in Mexico.

These instruments are closely linked to the CBD and in some cases were actually initiated by the convention (National Biodiversity Strategies and Action Plans).

Specific authorities are involved with conservation and protected areas, e.g. the Nature Conservation Sector at the Ministry for the Environment in Egypt. Protected areas are an important tool for the conservation of biodiversity and play a major role in impact mitigation. In some cases they may be protected from any intervention as noted for the “Protected forests” under the Argentinean Forestry Resources Act, which can only be altered to be “improved” ecologically (The American Chamber of Commerce in Argentina 2007: 34). In other cases, compensation may play a crucial role, as noted for “legal reserves”, which are the focus of the Brazilian forest offset. For example, under the project developers’ offset, the Conservation Units receive compensation benefits as defined by impact mitigation regulation of the Brazilian environmental licensing system. In Mexico, the Natural Protected Areas and the management units for the conservation and sustainable use of wildlife enable the creation, development and strengthening of markets for environmental services on a local, regional and global level. These enforce compensation mechanisms as instruments for the conservation of biological diversity (Estado de Mexico 2005: 25). The boundaries between compensation and preventive measures are often not strictly fixed. Effective and sustainable offset management schemes usually include restoration and compensation measures as well as conservation measures (e.g. the establishment of conservation zones or protected areas).

When considering the obligation for restoration of impacts on biological diversity and natural resources, impact mitigation regulations mostly focus on EIA as the main tool for implementation. For

¹² The objective as formulated in Art. 225, 1st paragraph, I of the Brazilian Federal Constitution is an example: to “preserve and restore the essential ecological processes and provide for the ecological treatment of species and ecosystems” (Escorcio Bezerra 2007: 31; Ministry of the Environment n.d.f: 27f)

example the Argentinean National Biodiversity Strategy targets the increase of national capacities in relation to biological diversity, aiming to strengthen EIA and environmental auditing (Probio 2004: 28). In addition to the legal basis, various guidelines at federal and provincial level or developed for specific sectors are available in Argentina, Egypt and Madagascar. For example, in 1994, the Egyptian Environmental Affairs Agency (EEAA) launched a programme of Support for Environmental Assessment and Management (SEAM) (EEAA n.d.c: n. pag.). Within the scope of SEAM, capacity building in EIA is being achieved through the implementation of EIA projects, the preparation of EIA Guidance Notes to assist local consultants in preparing EIA reports and through training workshops (EEAA n.d.c: n. pag.). Another example is Brazil's comprehensive and long-standing environmental licensing system. However, in the studied countries EIAs (and the corresponding mitigation and compensation measures) are only conducted for major engineering projects and programmes. This restriction represents a fundamental difference compared to the German Eingriffsregelung, which follows an area-wide approach. Consequently, in the studied countries a large number of impacts are not covered by mandatory compensation approaches, due to the absence of impact mitigation for small-scale projects and traditional land use practices (as mentioned previously) etc. This may lead to serious degradation of biodiversity in the studied countries.

Furthermore, no provisions are made for environmental compensation for existing facilities' impacts, even though these may generate enormous environmental damage and biodiversity loss. An exception is Madagascar, whose "Guidelines for the adaptation of conformance of investment with the environment" (Guide de Mise en Conformité MEC) established an impact mitigation procedure for existing facilities. In Egypt, new projects as well as expansions to existing projects are subject to an EIA before a permit can be issued (EEAA; Entec UK Ltd 2005a: 3).

In addition to the obligations for mandatory compensation, voluntary and alternative instruments are playing an increasing role. A voluntary environmental audit is a suitable complement where an EIA is not required. Provisions are made, for example, in the Argentinean National Biodiversity Strategy for the enforcement of environmental auditing. In Mexico, voluntary compliance measures are encouraged. The General Act on Ecological Equilibrium and Environmental Protection encourages the use of environmental audits to design preventive and remedial measures for the protection of the environment. Furthermore, voluntary biodiversity offsets have been noted for several projects, e.g. in the QMM ilmenite project in Madagascar.

Alternative instruments such as incentives and economic instruments are increasing in the studied countries. Payments for environmental services (e.g. ensuring water quality, and the maintenance and plantation of forests for carbon offsets) and other (financial) incentives are suitable tools to support the prevention and compensation of small-scale impacts (e.g. farming, logging, local community use of natural resources). Synergies between biological diversity and climate change are being developed in mitigation-based forestry projects (CBD 2007: 13).

In the wider context, (international) certification plays an increasing role for businesses, as multinational and other companies apply corporate policies that include ISO 14000 certification and Eco-Management and Audit Scheme EMAS (Congreso Regional de Ciencia y Tecnología 2002: 6). However, only some companies have voluntarily chosen to implement the principles of responsible use and care of the environment, while others respond to the demands of regulation (Congreso Regional de Ciencia y Tecnología 2002: 6).

Figure 41 summarises examples of conservation and restoration approaches.

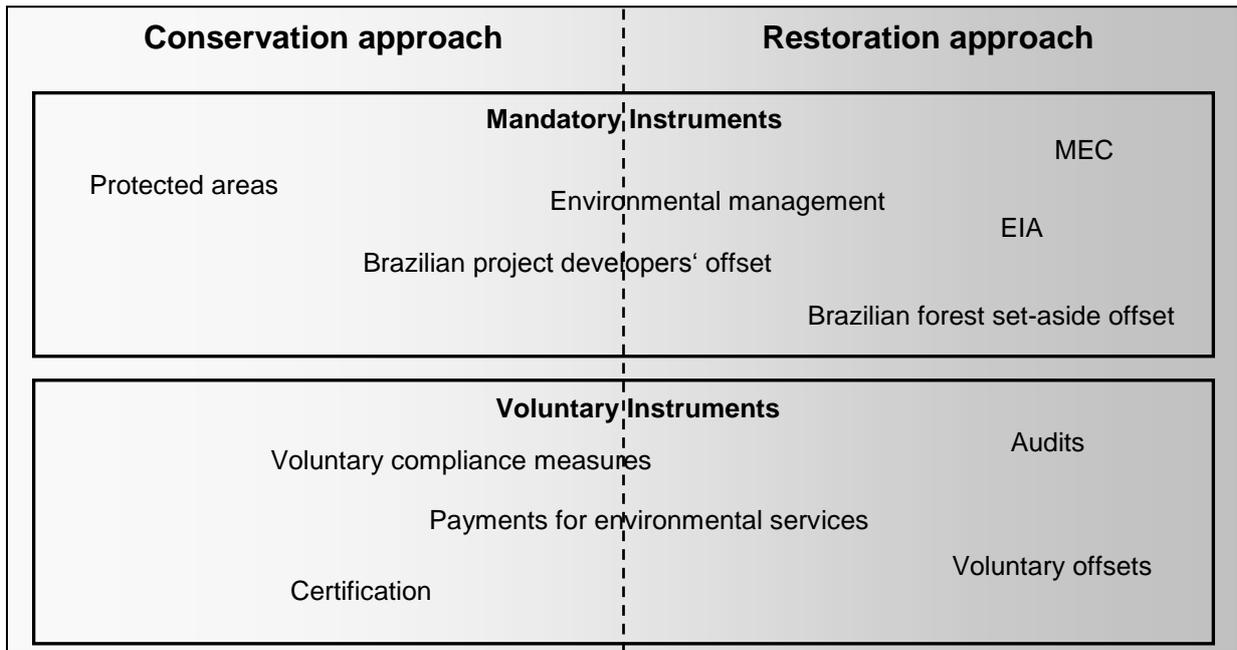


Figure 41: Examples of conservation and restoration approaches

7.2 Components of biodiversity and natural resources covered / measured

Each of the studied countries is a signatory to the CBD. Consequently, in the reviewed scientific papers reference is made to the CBD definition of biological diversity and respective components: “Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems” (Art. 2 CBD). Thus, a distinction is made between ecosystem diversity, species diversity and genetic diversity.

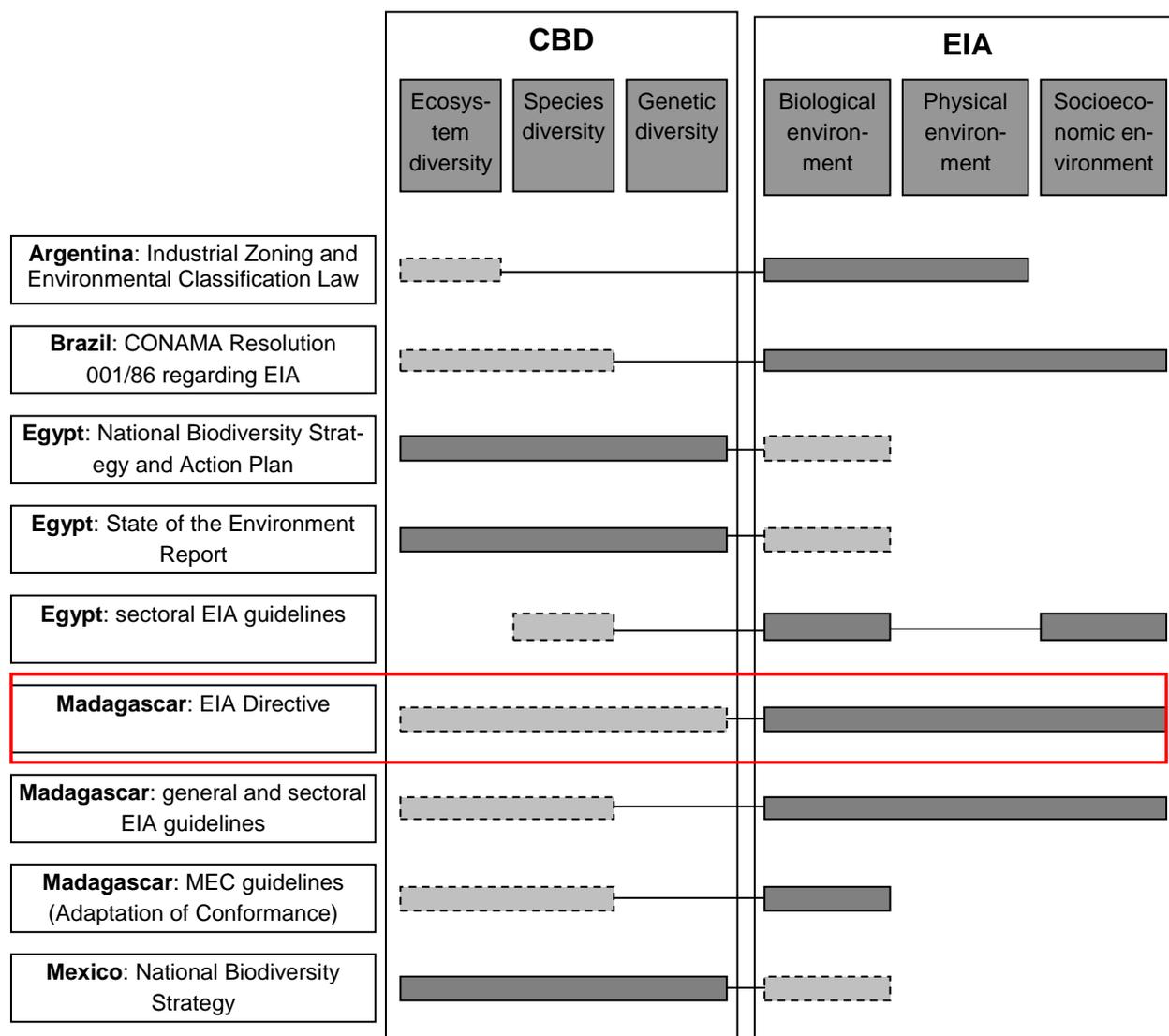


Figure 42: Components of biological diversity directly and indirectly relevant to instruments in the studied countries, divided into CBD-related and EIA-specific definitions

However, in impact mitigation regulation (IMR) practice, this distinction is not clearly applied. As noted in Chapter 7.1 a distinction can be made between conservation-oriented actions and restoration-oriented actions. The former focus on CBD-related definitions e.g. the Montréal Process Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests (see Table 19). The latter focus on EIA-specific environmental goods, e.g. CONAMA Resolution 001/86 regarding Environmental Impact Assessment in Brazil (see

Table 20). While conservation takes as its particular emphasis the protection of biodiversity, restoration usually covers a broader scope, including the biological, physical and socio-economic environments. Figure 42 plots the components of biological diversity against different instruments in the countries studied, sub-divided into CBD-related and EIA-specific definitions. In this figure, the dark grey bars represent the components directly relevant to each instrument, while the light grey bars show the components that are indirectly relevant. The connecting lines indicate the close linkage between the directly and indirectly relevant components. The Industrial Zoning and Environmental Classification Law in Argentina for example refers to EIA and specifically mentions the two components “Biological environment” and “Physical environment”. However, in the more detailed definition of these components, ecosystems are considered and therefore the CBD-related component “Ecosystem diversity” is indirectly included.

Table 19: Components and indicators of biodiversity developed by the Montréal Process Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests¹³

Ecosystem diversity	<ul style="list-style-type: none"> • Area and percentage of forest by forest ecosystem type, successional stage, age class, and forest ownership or tenure. • Area and percentage of forest in protected areas by forest ecosystem type, and by age class or successional stage. • Fragmentation of forests.
Species diversity	<ul style="list-style-type: none"> • Number of native forest associated species. • Number and status of native forest associated species at risk, as determined by legislation or scientific assessment. • Status of on-site and off-site efforts focused on the conservation of species diversity.
Genetic diversity	<ul style="list-style-type: none"> • Number and geographic distribution of forest associated species at risk of losing genetic variation and locally adapted genotypes. • Population levels of selected representative forest associated species used to describe genetic diversity.

Table 20: Components of biological diversity according to CONAMA Resolution 001/86 on Environmental Impact Assessment (Brazil)

Biological environment and natural ecosystems	<ul style="list-style-type: none"> • Fauna and flora, with special attention to species which are indicators of environmental quality, species of scientific and economic value, rare and endangered species, and permanent preservation areas.
Physical environment	<ul style="list-style-type: none"> • Underground, water, air and climate, with special attention to mineral resources, topography, soil types and capability, water bodies, hydrological regime, marine currents, and atmospheric currents.
Socio-economic environment	<ul style="list-style-type: none"> • Soil use and occupancy, water use, and socio-economic aspects, with special attention to archaeological, historical and cultural sites and monuments, any dependent relationships among the local communities and environmental resources, and the potential future use of these resources.

¹³ The Montréal Process Working Group has twelve member countries: Argentina, Australia, Canada, Chile, China, Japan, Korea, Mexico, New Zealand, the Russian Federation, the USA and Uruguay. It was formed in Geneva, Switzerland, in June 1994 to develop and implement internationally agreed criteria and indicators for the conservation and sustainable management of temperate and boreal forests (Montréal Process Working Group 2007: 1; Montréal Process Working Group 2005: n. pag.).

According to the EIA Directive in Madagascar, the components of biological diversity and natural resources can be seen as a combination of CBD-related and EIA-specific definitions (see Table 21). It combines the strengths of both: the comprehensive scope of the EIA that enables the consideration of complex interactions and a focus on ecosystem, species and genetic diversity of the CBD. Furthermore, it gives a broad overview of the sub-components and criteria by which ecosystems, flora and fauna (as well as the physical and the socio-economic environments) are defined. These detailed and concrete criteria provide a good basis for valuation of the environment and of potential impacts. However, a weakness is that it may require more work when used in practice.

Table 21: Components of biological diversity according to the EIA Directive (Madagascar)

Biological environment and natural ecosystems	<p>Ecosystems</p> <ul style="list-style-type: none"> • Types of existing ecosystems: terrestrial, aquatic, marine and coastal, wetlands. • Description and functions of the natural environment (particularly those that are ecologically sensitive). • Protected areas and sensitive zones. • Existing types of interaction or relation between flora, fauna and ecosystems. • Perpetuity and sensitivity (capacity to adapt to changes, proportions of rare or particular ecosystems affected by the project, operation modes etc.) • Local, regional, national or international interest (scientific, cultural, traditional, aesthetic, historical, recreational or educational). • Conservation and protection measures and status (in relation to legislation and national rules and international conventions). <p>Flora and vegetation</p> <ul style="list-style-type: none"> • Biodiversity of plants: composition of the vegetation (existing species), richness, endemism, particular plants or phylogenetic resources (ecological, commercial, aesthetic values), rare, vulnerable, threatened or protected species. • Characteristics of the vegetation cover: population types, existing sensitive or exceptional populations, percentage of vegetation cover, density, relative abundance, physical appearance, development stadium, annual cycles, distribution regeneration capacity, relation between flora and fauna etc. <p>Fauna</p> <ul style="list-style-type: none"> • Biodiversity of animals: faunistic composition, richness, endemism, rare, vulnerable, threatened or protected species, useful and harmful species. • Ecological and behavioural characteristics of animal communities: absolute abundance, density, relative abundance, indication of existence, biogeographical allocation, particular habitats, habitat and territory, migrations, alimentation, reproduction, annual cycles, mortality parameters, relation between flora and fauna etc.
Physical environment*	<ul style="list-style-type: none"> • Climate, meteorological conditions and air. • Geology, relief and pedology. • Water and hydrologic cycle.
Socio-economic environment*	<ul style="list-style-type: none"> • Social conditions. • Economic conditions. • Cultural conditions. • Spatial conditions.
* for more detailed information see Ministère de l'Environnement; Office National pour l'Environnement 2000: 37f	

7.3 Methods for valuation and quantification of potential impacts

In the studied countries, EIA – in its ‘pure’ form or as some variation such as an Environmental and Social Impact Assessment (ESIA / SEIA) – is the most commonly encountered instrument for the valuation of impacts and their mitigation and compensation.. In most of the countries studied, efforts are being made to integrate interrelated socio-economic, cultural and human-health aspects relevant to biological diversity when conducting EIAs. An excellent example is the sectoral EIA Guidelines for Pharmaceutical Plants in Egypt, which claim to consider the “general economic context including employment levels, existing industries in the local area, other proposed developments [and the] general social context including educational levels in the local population, participation in formal economic activities” (EEAA 2005a: 9f). This broad approach promoted within EIA is a strength as it takes into consideration the interaction between the natural and human environments and may prevent losses for the population and also secure the rights of indigenous communities.

Strategic Environmental Assessments do not yet play an important role in the studied countries. Nevertheless they are established for some plans in Egypt, Madagascar and Mexico (see Figure 43).

In addition to EIA, environmental auditing is playing an increasing role (see Chapter 7.1). The procedure for this voluntary instrument may follow that established for EIA. However, due to its voluntary nature, when compared to EIA it has the advantage that it is more flexible and that the proponent’s motivation for obtaining the best environmental and ecological outcomes is higher.

Argentina	Brazil	Egypt	Madagascar	Mexico
EIA for works and activities	EIA for facilities and activities	EIA for investment projects	EIA for projects	EIA for works and activities
		SEA applied in urban development plans	Only few SSEA (strategic social and environmental assessments)	SEA for plans and partial programs for urban development and/or ecological planning

Figure 43: Establishment of EIA and SEA in the countries studied

For the implementation of EIA general guidance is provided in the countries studied that specifies the EIA procedure (see Table 22). Additionally, in Egypt and Madagascar sectoral guidelines are in place to regulate how EIAs are conducted for specific sectors, e.g. tourism, urban development, road building and mining. In particular in Egypt, the responsible body at the Ministry for the Environment, the Egyptian Environmental Affairs Agency, is active in providing guidance, through the previously mentioned SEAM programme and through a considerable number of sectoral EIA guidelines. The strength of these sectoral guidelines lies in their elaboration of environmental impact studies, which is achieved by guidance that is laid out according to a standardised framework and also tailored to specific types of project. Nevertheless little is known about implementation and tangible projects in Egypt.

Table 22: EIA guidance in the studied countries

Country	EIA guidance
Argentina	General Environmental Guide for Investment Projects.
Brazil	Strongly differentiated environmental licensing system.
Egypt	Sectoral guidelines, environmental screening forms.
Madagascar	General directive, sectoral guidance.
Mexico	(Not identified).

Furthermore, in Egypt, Madagascar and Mexico EIAs are classified according to the severity of the impacts (see Chapter 6.3.3, 6.4.3 and 6.5.3, and Figure 44). In these three countries an environmental impact study is required for projects with major impacts on the environment. In Mexico, an additional distinction is made between projects requiring a specific EIA and those requiring a regional EIA. Alongside environmental impact studies a number of different instruments are in place in these countries for projects having minor impacts on the environment. These are the Preventive Report in Mexico and the Environmental Commitment Programme in Madagascar. In Egypt, for white and grey list projects Environmental Screening Forms are provided by the Egyptian Environmental Affairs Agency (EEAA). While Screening Form A may be filled out by the project proponent, Screening Form B has to be filled out by the EEAA or the Governorate. This methodological distinction between projects with minor and major impacts has the advantage that it facilitates practical implementation of EIA by reducing the effort and increasing efficiency.

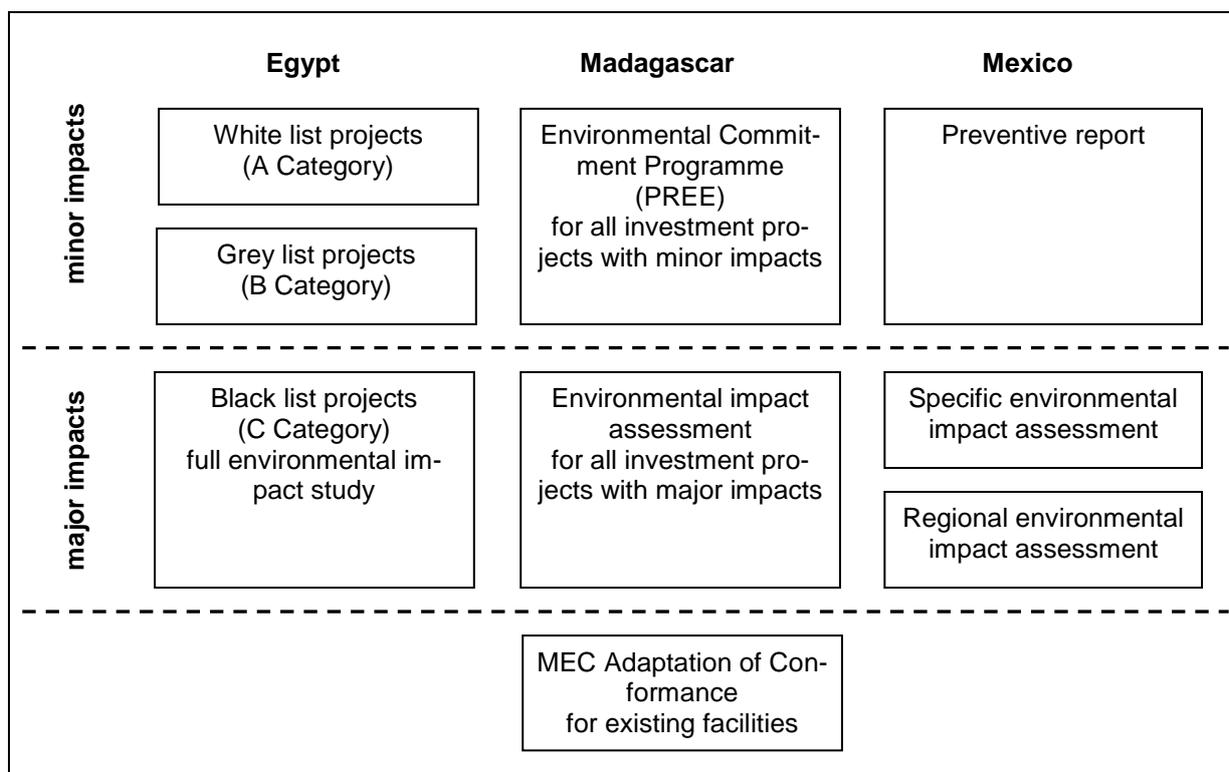


Figure 44: Classification of EIA requirements according to the severity of project impacts in Egypt, Madagascar and Mexico

Source: after EEAA 2005b: 4, Office National pour l'Environnement n.d.a: 4; Office National pour l'Environnement n.d.d: 5.

A particular example in Madagascar is the Adaptation of Conformance, a specific EIA tool under the Decree MECIE, which evaluates the impacts of existing facilities (see Chapter 6.4) and which follows the same procedures as the environmental impact study and the Environmental Commitment Programme.

The environmental planning process has to be integrated within the overall project design, with the goal of avoiding or minimising adverse environmental impacts from the outset. Environmental impact studies analyse potential predictable environmental impacts and assess their scale and relevant mitigation measures to ensure the integrity of the environment taking into consideration the best available technologies and economically acceptable costs. Consequently, the first step entails data collection and survey in order to establish the environmental baseline. Several sectoral guidelines in Egypt include habitat or species location maps showing the distribution of flora and fauna in relation to proposed works. These are suitable tools to identify which components of biological diversity might be potentially affected by the proposed development.

The use of matrices is favoured for example in Egyptian and Argentinean EIA practice. These can be very helpful in coordinating and summarising information gathered in the preliminary environmental appraisal. The strength of this qualitative tool is that it enables the relationship between the natural and human environments and the potential impacts to be visualised. Besides qualitative methods, quantitative methods may be applied depending on their feasibility. These are used to measure environmental impacts numerically or monetarily and employ variables such as the loss of vegetative cover in square meters. However, quantitative methods should not be applied alone, as they do not properly reflect the value of biodiversity, e.g. the cited example of loss of vegetative cover in square meters does not say anything about the type of ecosystem, the species richness and rarity etc.

The Brazilian licensing system follows a three-step procedure with respective licenses: previous license, installation license and operation license. The advantage of this complex procedure is that the assessment covers the project from design, through installation to operation. However, the procedure is time-consuming and requires high administrative expenses. This complex procedure also requires a substantial effort in terms of inspection. Consequently, a problem that is sometimes encountered is that the system is not properly implemented in practice.

An additional weakness is that the valuation of impacts is undertaken using a case-by-case approach, which complicates the valuation and makes it less transparent and more difficult to compare between projects. Yet, this is a problem that has been widely identified in different countries, resulting in a lack of standardised valuation schemes for biological diversity and impacts. In the countries studied no common criteria and general methods were identified. Even in the German context, with the advanced Eingriffsregelung, this is a problem. However, a difference arises in that numerous evaluation approaches available in Germany, from value point systems to cost-based approaches and verbal argumentation¹⁴ (e.g. biotope value approach, restoration cost approach), although which approach is best for balancing impacts remains under discussion. This underlines the fact that the valuation of biodiversity is still a great challenge.

In Brazil there are pilot projects that are attempting to assess the value of biological diversity as a means of facilitating the measurement of impacts on and losses of biodiversity. One approach tries to determine this value economically using a number of parameters. The concept of Economic Total Value highlights the influence that biological diversity has on various human interests. In Mexico,

¹⁴ Evaluation method that in contrast to quantitative approaches comes to a value judgement by descriptive argumentation without using any calculation and numeric scales.

Economic Total Value is recognised as an important tool. The economic value of natural resources is considered to be the key element for their efficient management (Estado de Mexico 2005: 2). Nevertheless, in both Brazil and Mexico the determination of Economic Total Value is completely different (see Chapters 6.2.3 and 6.5.3), making it clear that this concept is not technically mature. Furthermore the Mexican version appears rather theoretical. In this respect it will be difficult to determine, for example, the heritage value, which is described as the value of natural resources for future generations. This in turn makes it difficult to implement this concept in practice.

However, the strength of the Economic Total Value approach lies in the possibility of measuring the costs and benefits of biodiversity protection and conservation, in particular the costs of biodiversity loss related to project implementation.

7.4 Determining significance and thresholds

In the countries studied, the provisions for distinguishing between offsettable and not offsettable impacts were largely absent. In some cases (e.g. the Brazilian project developers' offset) the function of offsets as a "last resort" was noted. However, the implementation of this principle in practice cannot always be assured. Furthermore, the issue of irreplaceability and the "No Go" option (non-implementation of a project due to its potential environmental impacts) are not considered sufficiently in practice.

Nevertheless the compensation approaches studied provide criteria to determine the significance of impacts. In the main, these share some similarities (summarised in Table 23), the exception being the Guide for EIA in Mexico.

Table 23: Comparison of approaches and criteria used to determine the significance of impacts

Country	Argentina			Brazil	Egypt	Madagascar	Mexico
approach criteria	Fundamentals for the implementation of an EMS ¹⁵	General Environmental Guide for Investment Projects	Industrial Zoning and Environmental Classification Law	Environmental Impact Assessment	Sectoral EIA guidelines	EIA Directive	Guide for Environmental Impact Assessment
Duration	●	●		●	●	●	Does the project modify the natural dynamics of any body of water?
Positive / negative impacts		●	●	●	●	●	
Directness		●	●	●	●	●	
Magnitude and significance	●	●			●	●	Does the project modify the natural dynamics of flora and fauna populations?
Scale / extent / dimension	●	●			●	●	
Timing / Immediacy		●		●	●		Does the project modify the visual appearance of the landscape?
Reversibility		●	●		●		
Uncertainties		●				●	
Cumulative impacts					●	●	Does the project isolate or unify population
Probability of occurrence	●					●	
Public image / interest	●				●		

¹⁵ Chauvet, S.; Palacios, A.; García, V.; Congreso Regional de Ciencia y Tecnología 2002

Mutual reactions		●					units? Does the project modify the topography of the implantation area?
Risks for security, health, well-being						●	
Costs and feasibility of remediation	●						
Possible sanctions	●						

The presented criteria cannot be taken in isolation, but rather they form an interacting complex. The spatial and functional nature of the impact is described by the magnitude and significance and the scale. Magnitude is the intensity of the impact with regard to perturbation of the environment. Significance is the sensitivity, vulnerability, singularity or rarity of the affected component. Scale refers to the area that is affected by the impact (e.g. local and regional).

Temporal aspects represent another important group of criteria, most notably the duration of impacts. There are impacts that last only a very short time and others that may endure many years or even centuries. Alongside these temporary impacts, other impacts may be permanent. In this respect the question of reversibility is important and the feasibility and costs of remediation. Furthermore, timing must be considered. Some effects may appear immediately, while others may only become visible after many years. It is therefore standard practice to distinguish between short-, medium- and long-term consequences.

In addition, the general character of the impact is important, which may be positive or negative, direct or indirect. Cumulative impacts may also occur.

The probability of occurrence is another important indicator. Beyond this, countless additional criteria can be identified and used, e.g. criteria related to the interactions between project impacts, the environment and the project developer's reputation.

7.5 Mitigation hierarchy

As most of the studied approaches refer to EIA, this implies an adherence to the mitigation hierarchy, including the three basic steps of avoidance, minimisation and then compensation. Although this is applied as a general principle, the terminology varies considerably from one country to another. In the course of the EIA in Mexico for instance, prevention, mitigation and compensation measures need to be identified. By contrast, in Egyptian EIA practice the mitigation hierarchy is characterised by an iterative process of avoidance, minimisation and mitigation. In Argentina reference is made to prevention, correction and compensation. It is also clear that the same term sometimes has a different meaning, e.g. “mitigation” which may be used as a synonym for compensation as well as for minimisation.

Despite these differences, all approaches ultimately refer to the basic three steps. Nevertheless, the different terminology makes it more difficult to compare the approaches.

However, there is another fundamental problem: the mitigation hierarchy is not always clearly applied. While the steps avoidance (or prevention), restoration (or rehabilitation) and compensation (or indemnification) are usually formally established, these do not necessarily follow on from one another but exist in parallel; it is therefore difficult to distinguish between these steps. An example is EIA in Madagascar, where mitigation and compensation measures are presented together in the Project Environmental Management Plan and include measures to (a) preserve important components of the biological environment, (b) design and implement measures to minimise environmental impacts during construction and operation, and (c) restore the site and to compensate for residual impacts. During project implementation, environmental monitoring and follow up are used to assess the implementation of protection and mitigation or compensation measures and to establish new mitigation or restoration measures if necessary. The residual impacts that remain following the application of mitigation measures have to be defined and are then the subject of an environmental monitoring programme (see Figure 45).

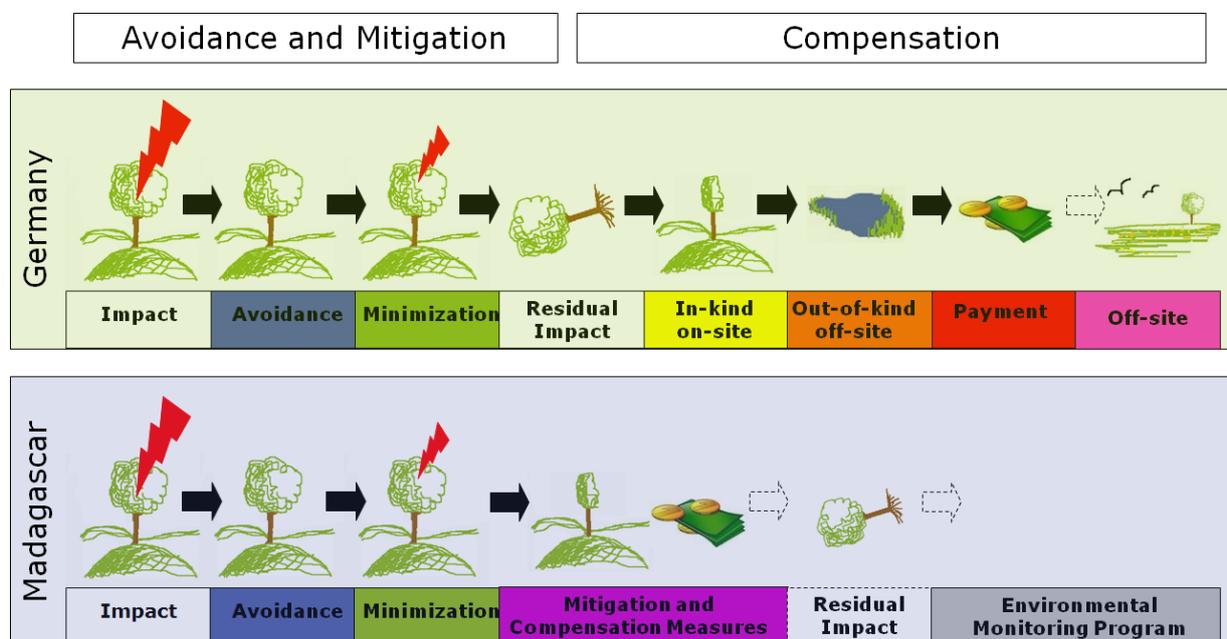


Figure 45: Application of the mitigation hierarchy according to Eingriffsregelung in Germany and EIA in Madagascar

This represents a fundamental difference to the German Eingriffsregelung and the US Wetland Mitigation approach. An advantage of the Malagasy approach is that mitigation and compensation measures

are interrelated in practice and thus practical implementation may be facilitated through the combined development of measures. Despite this, the clear application of the steps of the mitigation hierarchy as in the German Eingriffsregelung is preferable.

Another problem lies in the fact that even though the mitigation hierarchy is applied as a theoretical principle, the practical implementation in some cases remains doubtful. This is particularly the case for the avoidance and minimisation steps. It should be clear that biodiversity offsets have to be seen as a “last resort” (after appropriate avoidance and mitigation measures have been applied) (this is for example laid down in the Brazilian SNUC Act and SNUC Decree), only to be applied after all appropriate measures to avoid and minimise adverse impacts have been taken.

In this context the consideration of alternatives plays an important role in identifying the least damaging option for the environment. According to the Brazilian project developers’ offset, the process of environmental licensing includes consideration of all technological and location alternatives for the project, including “No Go” (non-implementation). However, project non-implementation appears rare in practice. A weakness of biodiversity offsets thus lies in the risk that projects that should have been rejected may in some cases be approved based on the associated obligation to compensate for impacts. In the Egyptian National Report, this problem is highlighted by the only limited requirement for inclusion of development alternatives.

Another important aspect of the mitigation hierarchy is compensation payments. The Argentinean Constitution and the Mexican Civil Code both stipulate that compensation payments are only appropriate if recomposition or restitution is impossible. Likewise, under the German Eingriffsregelung, monetary compensation may only be allowed if physical (real) compensation is impossible. By contrast, in the Brazilian project developers’ offset, compensation payments and real compensation measures stand side-by-side. Since establishment of the Environmental Compensation Fund (ECF), the project proponent may now choose to define and implementing measures themselves or instead issue a compensation payment to the ECF. The weakness of this approach is that removing the obligation to be directly involved in conservation and compensation measures may send out the wrong signal that making payments is enough to resolve environmental issues and that there is no need to commit business to environmental initiatives.

7.6 Determining offset demand

In all of the countries studied there is no general methodology available to determine the offset demand and design compensation measures. Usually a case-by-case approach is taken. This implies a lack of general predefined, comparable and transparent criteria, although in Egypt and Madagascar the sectoral EIA guidelines do at least give examples of specific mitigation and compensation measures that can be applied for projects in relevant sectors.

Taking a case-by-case approach means that one of the central questions, how to determine the compensation ratio, cannot be completely answered. For the Brazilian project developers' offset this problem is now at least being discussed. Previously, project proponents were obliged to pay a fixed minimum amount of 0.5% of the investment cost and apply this to compensation measures. Recently however, the supreme court decided in favour of some national industries that claimed this obligation was illegal. The discussion is ongoing of whether a fixed compensation ratio (e.g. as a percentage of the investment costs) is appropriate. However, the concept of a fixed compensation ratio should be viewed critically as this approach may not always respond to actual needs. There may be for example cases where relatively low investment costs may lead to disproportionately high environmental degradation, as has been reported for some mining projects in Brazil. Therefore it is the methods and tools to determine the ratio that need to be discussed and standardised, rather than the ratio itself. Ideally, this can be done in tandem with discussions about methods and tools to value biological diversity and natural resources and impacts on these. In this context, EIA practice may take a leading role. Given that EIA is widely established as an efficient and well-developed instrument, the relevant procedures and methods and its institutional infrastructure can be used. This may facilitate the implementation of biodiversity offsets, especially in less developed countries. Therefore the integration of biodiversity offsets into EIA is a preferred option. Nevertheless this general regulation needs to be flexible enough to be adapted to cases in which no EIA has been applied. In these cases the EIA procedure may serve as an example that has to be modified and detailed for the specific situation. In conclusion, a biodiversity offset approach that is integrated into EIA offers the advantage of building on existing experience with EIA in a process that is more transparent and allows comparison of different projects.

One of the most important issues related to biodiversity compensation is the functional, spatial and temporal relationship between offsets and impacts. The "no net loss principle" requires that biodiversity offsets are established in relation to the affected area. While no clear predications could be identified for most of the approaches studied, during the course of an EIA preference is normally given to on-site rather than off-site measures. This aim is also one of the fundamentals tenets of the German Eingriffsregelung, where preference is given to in-kind restitution ("like-for-like") and therefore, compensation measures primarily have to be executed on-site. Off-site and out-of-kind measures are a second step only, while as a last resort, compensation payments may be implemented in order to ensure compliance with the "no net loss principle". Similar to the US Wetland Mitigation (which requires offsets to be implemented within the same watershed) the German Eingriffsregelung requires implementation in the same natural landscape unit.

In contrast, the two mandatory Brazilian offset schemes both build on the idea of off-site offsetting. In the case of the forest set-aside offsets, a preference is however given to in-kind solutions through the requirement for the offset to be the same type of ecosystem within the same watershed.

In the case of the project developers' offset, the link between impacts and offsets is intentionally dissolved, obliging the project proponent to issue a compensation payment to the National System of Conservation Units. However, a weakness of this approach lies in the ultimate destination of these compensation payments. When monetary compensation measures are merely used for the management and maintenance of existing protected areas (which normally is under governmental responsibility), this does not generate an additional net gain to counterbalance the project-related loss (there is

no additionality). In this case, alignment with the “no net loss principle” is questionable. The reduction of governmental activities through a shift of their conservation and other obligations to biodiversity offsets is a threat to biodiversity conservation and has to be seen critically.

Another obstacle to biodiversity offsets that has been encountered is the relevance of measures, once these are implemented. To ensure long-term efficiency environmental management was highlighted as a suitable framework. In Mexico for example the mitigation and compensation measures are laid down in the Environmental Management Plan, which contains a mitigation programme (including mechanisms and actions to minimise negative environmental impacts during construction, operation and closure), a compensation programme (including measures such as reforestation programmes) and a follow-up programme to verify environmental performance. Ideally, compensation measures should be subject to monitoring and follow-up as a control mechanism.

Finally, a study of World Bank case studies on conservation and infrastructure projects in Latin America is worthy of note as it identified a number of successful strategies for compensation:

1. Promoting development through well-designed infrastructure projects can check or even reverse degradation of natural habitats and the loss of biodiversity.
2. Thorough Environmental Assessments are the foundation of successful environmental outcomes.
3. Early involvement of stakeholders improves project design, operation, and management.
4. Timing is crucial: the nature of key actions may be ineffective if they are not carried out at given times during the project.
5. Compensation and restoration measures with successful outcomes can be achieved even when impacts are identified during project implementation.
6. Efforts to establish new protected areas need to be started during project preparation.
7. Large-scale projects facilitate institutional strengthening and restructuring.
8. Localised projects enable more in-depth, site-specific actions (Quintero 2007: ix).

7.7 Implementation and responsibilities

The “polluter pays principle” is widely recognised in many countries. This includes the requirement for the project promoter to meet the costs of undertaking an EIA (if required) and for mitigation and compensation measures. However, a problem that is often encountered in practice is the difficulty in attributing liability for perceived environmental degradation to a specific individual, company or group of individuals. This problem of heightened “common” or “public” environmental damages leads to high external costs. Cumulative impacts and impacts arising from joint responsibility are mostly not covered by the “polluter pays principle”. Here, other financing and funding models may provide a solution. These compensation or restoration funds are either fully integrated into an existing compensation approach as in the case of the Brazilian environmental compensation fund (ECF), which is a central management and financing tool in the project developers’ offset. Its strengths are that it facilitates the implementation of compensation measures and the process is more standardised. The money is target-oriented and may be directed to the System of National Conservation Units. Notwithstanding these strengths, the ECF still has drawbacks, in that it results in diminished involvement of the polluter in the definition and implementation of compensation measures and reinforces the concept that compensation payments are sufficient and may free the project proponent from its liabilities.

Other funds have been established to support the compensation of environmental hazards and impacts with common or no clear responsibility, or serve as complementary financial support. These are summarised in Table 24 for the countries studied.

Table 24: Funds in the countries studied

Country	Fund(s)
Argentina	Environmental Compensation Fund
Brazil	Environmental Compensation Fund
Egypt	Environmental Protection Fund
Madagascar	-
Mexico	Fund for the Restoration and Preservation of Biodiversity Fund for the Reparation of Environmental Deterioration

Compensation funds are systems of joint compensation. These economic structures are organised and managed both by the public sector (such as in the case of the American “Superfund”¹⁶) and by private groups. The Superfund’s funding is derived mainly from the collection of charges or contributions from the sectors that are responsible for environmental impacts that have to be prevented or compensated. Unlike an insurance system, the Superfund provides wider and faster coverage against environmental impacts (Valls de Rossi n.d.: 2):

- The wider coverage allows the problems of pollution damage to be solved, even those caused by the normal functioning of facilities, by enduring pollution or by historic pollution (all of which are generally excluded from insurance coverage for environmental impact). Additionally, this system

¹⁶ for more information see <http://www.epa.gov/superfund/>

does not provide a limited liability, although it is ultimately limited by the availability of money in the fund.

- It is faster than the traditional civil liability mechanism, which is characterised by the difficulty of demonstrating proof of liability and generally slow procedures (Valls de Rossi n.d.: 2).

Existing compensation funds adopt different techniques together or independently to achieve their compensatory goal:

- Security function: acts independently from the regime of responsibility, when the victim does not get compensation, a responsible person is not identified or the responsible is insolvent,
- Additional function: acts when the damage exceeds the ceiling for liability or when the responsible is insolvent,
- Subrogation function: repairs the damage immediately and then recovers it from the responsible (Valls de Rossi n.d.: 2).

There are also funds that operate in autonomous cases of damage by unidentified sources.

Funding models and in particular compensation funds share a number of advantages. One merit lies in the availability of financial means in a short period of time. Furthermore, funds can operate independently from administrative structures. Another advantage is that it is possible to react directly to environmental degradation without needing to resolve the question of who is, or can be held, liable. Nevertheless, funding models should not replace the traditional system of liability based on the “polluter pays principle” as this might lead to a “pay and forget” approach and thus weaken environmental awareness. Instead, compensation in the context polluter’s liability and compensation funds should be viewed as complementary and thus able to improve the protection of biological diversity and natural resources.

7.8 Summary

The main findings relating to the compensation approaches in the countries studied (Argentina, Brazil, Egypt, Madagascar and Mexico) are summarised in Table 25. Information is grouped under the following criteria:

- Legal situation.
- Instruments.
- Mitigation hierarchy and principles.
- Compensation.
- Liability / responsibility.
- Financing.

Table 25: Summary and comparison of selected aspects of compensation approaches in different countries

Country	Criteria	Description
Argentina	Legal Situation	<p>The Federal Constitution emphasises the duty of each resident to conserve the environment for future use and requires the redress of environmental harm, aiming to restore the environment to its prior state.</p> <p>The Environmental Framework Law (LGA) regulates the territory's environmental organisation and provisions related to EIA as well as minimum environmental protection standards for adequate and sustainable environmental management, the preservation and protection of biological diversity and the implementation of sustainable development. Due to the federal organisation of the country a multitude of laws and provisions at provincial and municipal levels are aimed at the implementation of goals set by federal legislation.</p>
	Instruments	<p>Legislation for the execution of EIA for projects with potential adverse effects on biodiversity is established (but not yet for the level of plans, programmes or politics: the obligation to and procedure for undertaking an EIA is fixed in the LGA. The General Environmental Guide for Investment Projects details the procedure for impact evaluation and the relevant methods. Social Impact Assessments are part of the EIA (Environmental and Social Impact Studies).</p> <p>A Biodiversity Action Plan allows a company to evaluate and understand the impact of its activities on biodiversity, and to establish a management plan to handle the situation. EIA procedures in Argentina are implemented at the provincial and municipal levels, or are applied on a sector-by-sector basis. Various sectoral regulations (hydrocarbons, mining etc.) or regulations at the provincial level exist.</p> <p>There is a range of environmental management tools available. Biodiversity issues can be integrated into different elements of Environmental Management Systems e.g. the Environmental Policy, a public commitment to protect biodiversity that incorporates a recognition of potential impacts of the company's activities, including especially mitigation and monitoring of secondary impacts. The main tool adopted by Argentina is the Environmental Adjustment and Management Plan which must be included in the EIS, and which contains "all the actions for mitigation, rehabilitation or re-composition aimed at correcting any future environmental impact".</p> <p>In addition, there are alternative instruments to enforce biodiversity concerns such as deterrent instruments or economic instruments and certification (particularly EMAS).</p>
	Mitigation hierarchy and principles	<p>In Article 41 of the Constitution it is repeatedly noted that causing environmental damage will generate an obligation of reposition. Article 1083 of the Civil Code supports this, aiming to restore a damaged ecosystem into its previous state, with the exception that, in cases where this might be impossible, the compensation shall be fixed in an amount of money (compensation payment). Additionally the injured party may opt for a monetary indemnification.</p> <p>The Environmental Framework Law (LGA) formulates as one of its general objectives the establishment of adequate procedures and mechanisms for the minimisation of environmental risks, for the prevention and mitigation of environmental emergencies and for the restoration of impacts caused by environmental pollution.</p>

Country	Criteria	Description
		<p>With respect to environmental management, a distinction is made between preventive and remedial measures. The former are intended to avoid negative impacts on the environment. The latter are applied after the activity has been undertaken and can be divided into corrective and compensatory measures. Corrective measures try to cancel, edit, modify or attenuate negative impacts on the environment, while compensatory measures seek to compensate the harmful effects on the environment when these are unavoidable and irrecoverable, e.g. through payments for pollution or the creation of green areas etc.</p> <p>The Environmental Management Plan encompasses the formulation of adequate mitigation measures to prevent, correct or compensate negative environmental effects of a project. Accordingly, when impacts occur in the absence of mitigation, the project proponent must justify why no such measures were applied.</p>
	Compensation	<p>According to Art. 28 of the LGA when real (natural) compensation is impossible a compensation payment has to be made to the Environmental Compensation Fund. This should then be employed to offset the irreparable harm in accordance with a policy that compensates the loss and prevents future damage of this kind, such as establishing a habitat or protected area for species that face the threat of extinction in other areas or developing social campaigns for education and awareness raising amongst the general population, in order to address contamination caused by waste by reduction and recycling.</p> <p>The Environmental Compensation Fund is intended to ensure environmental quality, the prevention and mitigation of dangerous or harmful effects on the environment, responses to environmental emergencies, as well as the protection, preservation, conservation or compensation of ecological systems and the environment. The main function that the LGA specifically assigned to the fund is compensatory.</p>
	Liability / responsibility	<p>The “polluter pays principle” is widely recognised amongst environmental economists in Argentina.</p> <p>The rules of the Civil Code, as related to the scope of repairing the damages caused to a single person or its properties by the actions of a third party (in Art. 901-903), state that the immediate consequences of actions are attributable to their author.</p> <p>Beyond these general provisions, for damages caused by industrial waste the polluter will remain liable in the event of its transformation or treatment (according to the guidelines of the Hazardous Waste Law).</p> <p>The LGA fixes responsibility and reparation for damage to biological diversity and establishes in its articles 27 – 33 the norms for any licit or illicit action (or omission) that causes environmental damage. Those who cause environmental damage will be responsible for restoration to the natural status. This refers to current or future degrading effects on the environment and covers all costs for preventive measures and corrective restoration.</p> <p>For collective environmental damage caused by two or more parties “all of them shall be jointly and severally liable, without detriment, if applicable, to the right of contribution among them” (The American Chamber of Commerce in Argentina 2007: 14).</p>

Country	Criteria	Description
	Financing	<p>The LGA states that “any individual or legal entity performing activities hazardous to the environment must obtain an insurance which shall guarantee that any possible damages caused to the environment will be cured; likewise, on a case-by-case basis and depending on the possibilities, it may create an environmental restoration fund to instrument restoration actions” (The American Chamber of Commerce in Argentina 2007: 14).</p> <p>Additionally, Art. 34 and 35 of the LGA establish the need to create a public (Federal) Environmental Compensation Fund. This Environmental Compensation Fund will be administered by the competent authority in each jurisdiction who may determine that such a fund contributes to sustaining the costs of restoration actions that could minimise the damage created. The financial support of this fund should come mainly from the private sector that is the generator of pollution and should tend towards self-financing by charging fees, royalties or other environmental taxes. Additionally Art. 28 of the LGA provides for indemnification (compensation payments) that result from the liability regime when the restoration of environmental impacts is not possible and which are added to the fund.</p>
Brazil	Legal Situation	<p>The National Environmental Policy Act (LPNMA) is the basis for the Brazilian Environmental Policy and sets up the National Environment System, comprising federal state and local government authorities. There are various legal texts and provisions regarding biological diversity and the environment. Component four of the National Biodiversity Policy focuses on “Monitoring, Assessment, Prevention and Mitigation of Impacts on Biodiversity” and “contains directives for the strengthening of systems for monitoring, assessing, preventing and mitigating impacts on biodiversity, as well as to promote restoration of degraded ecosystems and over-exploited biodiversity components”. With respect to biodiversity compensation there are two key legal arrangements: the Forest Code and the SNUC Act. The latter created the National System of Conservation Units (SNUC), aimed at the establishment, administration, maintenance and enhancement of protected areas.</p>
	Instruments	<p>There are two different mandatory instruments for biodiversity offsets in place: the “forest set-aside offset”, which builds on the provisions in the Forest Code and the “project developers’ offset” under the SNUC Act.</p> <p>Forest set-aside offset: the Forest Code established the concepts of permanent preservation areas and legal forest reserves. The former have to be maintained as an “untouchable space with a permanent environmental function” and exempt from removal of vegetation which, by way of exception, can only be done with the prior authorisation of the responsible environmental authority and with an accompanying obligation to adopt compensatory measures. Art. 16 of the Forest Code requires that rural landowners maintain a fixed minimum percentage of natural vegetative cover on their property as legal forest reserves, ranging from 20% to 80% depending on the region. Clearance of this cover is prohibited. Landowners who do not comply with these provisions are obligated to seek compliance and / or to compensate.</p> <p>Project developers’ offset: this compulsory approach is closely linked to the environmental licensing system and impact assessment. The project developers’ offset approach integrates environmental licensing provisions and the SNUC Act. The funds necessary for the establishment and the</p>

Country	Criteria	Description
		<p>maintenance or enhancement of protected areas come from compensation payments for investment projects as required by the environmental licensing system. The licensing procedure builds on three sequential processes: the Previous license is granted at the preliminary stage of a project or activity, approving its location and concept, certifying its environmental feasibility and establishing basic conditions to be met at the next stages of its implementation, possibly including the obligation to undertake an EIA and RIMA. With the Construction license authorisation is given for the installation of the project or activity in accordance with specifications contained in the approved plans, programmes and projects, including the environmental control measures and other conditions. The Operation license authorises the operation of the project activity, after verification of effective compliance with conditions set forth in the previous licenses.</p> <p>There are various projects using voluntary (economic) instruments for biodiversity offsets. Green VAT is one example. Local authorities receive a two percent bonus from the VAT when they renounce landuse in newly designated protected areas.</p> <p>Biodiversity issues are addressed through integration with initiatives addressing climate change, e.g. creating a benefit for biodiversity through carbon fixation in forests. Furthermore, several initiatives exist that relate to payments for environmental services (e.g. the Proambiente Program) and certification (e.g. the Brazilian Program of Forest Certification).</p>
	Mitigation hierarchy	<p>With respect to the mitigation hierarchy there is a fundamental difference between the two mandatory biodiversity compensation approaches in Brazil. Whereas forest set-aside offsets have no direct implication for the principle of mitigation hierarchy, the project developers' offsets are inseparably linked to it. This linkage occurs as the latter are associated with the environmental licensing system and EIA, which creates an obligation to apply the mitigation hierarchy. This includes considering all the technological and location-related alternatives for the project, including a non-implementation ("No Go") hypothesis. Mitigation measures have to be defined for the negative impacts of projects, with due consideration and assessment of the efficiency of control and monitoring. Finally, biodiversity offsets seek to compensate for the residual impact to biodiversity that remains after the application of the mitigation hierarchy (avoidance and mitigation of potential impacts). Art. 36 of the SNUC Act and Art. 31 of the SNUC Decree underline this function, considering it a "last resort".</p>
	Compensation	<p>Forest set-aside offset: the fundamentals of environmental compensation for forest set-aside offsets are laid down in Art. 44 of the Forest Code, which stipulates that the owner of a rural property who does not comply with the minimum percentages of native vegetation cover must undertake the following measures: (i) recompose the legal reserve of the property through plantation with native species (every three years, at least one-tenth of the necessary complementary area has to be planted, in accordance with the criteria established by the competent state environmental authority), (ii) conduct regeneration of the legal reserve and (iii) compensate the legal reserve with another area with equivalent ecological importance, if it belongs to the same ecosystem and is located in the same micro-basin. Fol-</p>

Country	Criteria	Description
		<p>Following these provisions, the Brazilian forest set-aside offset is mainly built on the concept of off-site offsetting. However, emphasis is placed on in-kind solutions by requiring that the offset is of the same type of ecosystem within the watershed. Where this is impossible due to a lack of natural vegetation, the offset should be as close as possible to the rural property seeking compliance with the legal minimum percentage and within the same river basin and State. These off-site offsets can be implemented either by renting areas under forest services or by the acquisition of a legal forest reserve quota. The offset has to be approved by the competent environmental authority prior to its implementation, in order to assure the principle of no net loss of habitat, the focus on in-kind equivalence and the additionality of the offset.</p> <p>Project developers' offset: developers of projects, for which EIA and RIMA are required, must offset their residual environmental impacts by supporting the establishment and maintenance of conservation units through a payment to the SNUC, which is fixed at the minimum rate of 0.5% of the total costs of the development, adjusted to the degree of impact established by the environmental licensing authority (through prior environmental impact studies). Nevertheless, detailed guidance for determining the offset amount is lacking and thus the amount is fixed on a case-by-case basis by the responsible environmental authority.</p> <p>The SNUC Act includes as its first objective the maintenance of biodiversity and thus refers to the "no net loss principle". Compensation payments must be spent on the creation, implantation or maintenance of Conservation Units. According to Art. 36 § 3 of the SNUC Act the offset may be directed to any existing or newly created conservation unit of integral protection within the SNUC, with the exception that if the development directly impacts a specific conservation unit or its buffer zone, this unit must be benefited by the payment. As there is no strict linkage between environmental impacts and the benefits arising from offset payments, the project developers' offset builds on the concept of off-site and out-of-kind compensation. The responsible environmental body makes the final choice as to how the money will be spent: on the regularisation of land tenure and land demarcation; the definition, revision or implementation of a management plan; the acquisition of goods and services necessary to establish, manage, monitor and protect a conservation unit, including its buffer zone; studies necessary for the creation of a new conservation unit and the development of research necessary to manage the conservation unit and its buffer zone.</p>
	Liability / responsibility	<p>Both biodiversity offsets build on the "polluter pays principle". But whereas for the forest set-aside offset rural landowners are responsible for implementing restoration and / or compensation measures themselves or by contracting a third party, for the project developers' offset the obligation of the polluter is limited to an offset payment, without there necessarily being a concomitant involvement in implementing compensation measures. With the creation of the Environmental Compensation Fund in 2006, the polluter may now choose between direct execution and depositing the compensation payment with the fund.</p>
	Financing	<p>The Ministry of Environment highlights environmental compensation as the most promising approach for covering the needs of protected areas. In this respect the Environmental Compensation Fund was created with the</p>

Country	Criteria	Description
		<p>goal of providing an alternative for implementing obligations contained in the SNUC Act. This fund is the result of the partnership between the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) and the National Savings Bank, which manages the fund. The fund is an investment fund restricted to the application of resources from environmental compensation, which is composed of federal public securities (80%) and private securities of low credit risk (20%). By depositing the compensation payment at the fund and signing a contract the project developer automatically transfers the financial execution aspect to the responsible body at IBAMA, which is the Chico Mendes Institute for Biodiversity Conservation. The operation of the fund by the bank is associated with a range of services aimed at implementing the actions of environmental compensation, which entrepreneurs can choose not to partake in.</p>
Egypt	Legal Situation	<p>Biodiversity is still considered in only a few laws that focus on conservation issues. The most important of these are Law 102/1983 for the Natural Protectorates and Law 4/1994 for the Environment, the latter being the most relevant to compensation issues as it stipulates the establishment of an Environmental Protection Fund and considers impacts due to development projects.</p>
	Instruments	<p>The EIA is the most common instrument in Egypt for addressing compensation issues. Biodiversity is being considered in many EIAs reviewed by the Egyptian Environmental Affairs Agency (EEAA). Alongside the EIA, Environmental and Social Impact Assessments are being undertaken. The EEAA launched a Programme of Support for Environmental Assessment and Management (SEAM) and issued a number of sectoral EIA guidelines for specific development projects and environmental screening forms. The EIA process in Egypt is specified by relevant articles in Law 4/1994 for the Environment. Using a list approach, projects are screened into three different levels of EIA requirement according to severity of possible environmental impacts: for white list (A-category) projects the developer fills out an Environmental Screening Form (A). The competent administrative authority will send the form to the EEAA to be reviewed and evaluated within the legal period; otherwise the EIA report is considered accepted. For grey list (B-category) projects the developer requests an Environmental Screening Form (B) to be completed by the Governorate or EEAA. For black list (C-category) projects a full EIA is required following the Guidelines.</p>
	Mitigation hierarchy	<p>The Egyptian National Report (2002) states that the inclusion of development alternatives and mitigation measures and the elaboration of compensation measures are only required to a limited extent. Nevertheless, several EIA Guidelines refer to the mitigation hierarchy. Mitigation should be an iterative process, identifying mitigation measures at three levels: to avoid the expected side effects before they are in place, to minimise their impact and to mitigate the effects that could not be avoided or minimised (compensation).</p> <p>The mitigation strategy includes the consideration of alternatives. It has to ensure that for each adverse impact that is identified, a mitigation measure is identified which will reduce the impact to an acceptable level. The severity of the residual impacts must also be defined. They should be subject to monitoring in the form of an environmental management plan (EMP) in order to determine the effectiveness of each mitigation measure.</p>

Country	Criteria	Description
	Compensation	<p>There is no general methodology provided for determining environmental (biodiversity) compensation i.e. the type and ratio etc. Instead more or less specific mitigation measures are proposed as exemplars for each sector covered by the guidelines. Even though biodiversity cuts across, and is impacted by, several issues, mitigation measures for flora and fauna are stated explicitly. These include compensatory planting or restocking of indigenous species, provision of new appropriate habitat, opportunities for colonisation, careful timing of major disturbances and measures to control and prevent infestations at the site and to control the spread into localities adjacent to the project.</p> <p>The application of the ecosystem approach is being favoured.</p>
	Liability / responsibility	<p>Law 4/1994 for the Environment does not specifically refer to the “polluter pays principle”. However on the question of liability the law gives competent authorities the right to recover pollution-related costs from the responsible party and to claim damages for losses incurred and injuries caused by such pollution.</p> <p>Additionally, the responsibility of the polluter for damage caused is further underlined in the various sectoral EIA guidelines, which establish the need for the project promoter to avoid, mitigate and / or compensate negative impacts on the environment.</p>
	Financing	<p>Article 7 of Law 4/1994 for the Environment proposed the establishment of an Environment Protection Fund within the EEAA, to which payments collected on a temporary basis as fines and compensation for damage to the environment would be contributed. The resources of this fund shall then be used to fulfil the objectives and tasks of the EEAA, including responses to environmental disasters and pollution from unknown sources, the establishment, operation and administration of Environmental Monitoring Networks and Nature Reserves and participation in financing environmental protection projects undertaken by local administrative agencies and grass-roots organisations (which are partly financed through popular participation).</p>
Madagascar	Legal Situation	<p>In 1992 the Malagasy government established the Environmental Action Plan and in 2004 launched the vision “Madagascar Naturally”, which in 2006 was translated into an operational programme in the form of the Madagascar Action Plan. One of the priority actions is to develop a policy for mining companies and logging companies for biodiversity offsets.</p> <p>The most important legal references for biodiversity compensation issues are the Malagasy Environmental Charter and the Decree MECIE. Article 10 of the Environmental Charter requires an EIA for public and private investment projects likely to cause adverse effects on the environment. The Decree MECIE specifies the conditions, the procedure and the responsible parties. Additionally, in 2000 the Ministry for the Environment published the General Directive for the realisation of an EIA.</p> <p>For the mining sector the obligation to carry out an EIA is set out in the Mining Code.</p>
	Instruments	<p>The Environmental Action Plan introduced a number of methodological tools, among which the Environmental Impact Study is considered to be the most highly developed in Madagascar. By comparison, only a few Str-</p>

Country	Criteria	Description
		<p>ategic Social and Environmental Assessments have been conducted, notably in the mining sector. According to technical specifications, project magnitude and location, three types of EIA are distinguished: the Environmental Impact Study applicable to all investment projects with major impacts on the environment, the Environmental Commitment Programme for all investment projects with minor impacts on the environment and the Adaptation of Conformance for existing enterprises. The definition of the EIA must be based on the General Directive for the realisation of an EIA together with the respective sectoral EIA Guidelines (for tourism, roads, aquaculture, on- and off-shore oil, forests, textiles and mining). For the development of an Adaptation of Conformance, the Guidelines for the Adaptation of Conformance of Investment with the Environment should be considered.</p> <p>The mining sector developed Good Governance and Asset Management Principles to improve environmental performance and management of national assets, and recently net biodiversity gain policies have been developed by some companies.</p> <p>Various industries (e.g. forestry and fisheries) are progressively adopting internationally recognised certification systems.</p>
	Mitigation hierarchy	<p>The mitigation of impacts consists of presenting actions or measures to prevent, avoid or reduce negative impacts or to increase the benefits for the environment. Adequate mitigation and / or compensation measures have to be determined for each stage of the project's lifecycle, source of impacts, action or activity that has a negative influence on one or several components of the environment.</p> <p>The mitigation and compensation measures are presented together in the Project Environmental Management Plan and include measures to preserve the important components of the biological environment (habitats of flora and fauna, mangroves, corals etc.), to design and implement measures to reduce to a minimum environmental impacts during construction and operation, to restore the site and to compensate for residual impacts.</p> <p>During project implementation, environmental monitoring and follow-up are used to verify protection and mitigation or compensation measures and indicate when additional mitigation or restoration measures may be appropriate. The residual impacts that remain after the application of mitigation measures should also be noted and subject to environmental monitoring and follow-up.</p>
	Compensation	<p>Mitigation and compensation measures are presented together in the Project Environmental Management Plan, divided into general and specific mitigation and compensation measures. The former aim to mitigate the negative effects of a project as a whole, while the latter are used to address the negative impacts on specific components of the environment</p> <p>The sectoral guidelines for the development of EIAs for forestry, tourism and the oil and gas sector all include a table with examples of specific mitigation and compensation measures for the different probable impacts on physical, biological and human environment.</p>
	Liability / responsibility	<p>The Environmental Charter does not include a general obligation regarding the liability of those causing environmental damage. However, where projects require an EIA, the project promoter is responsible for the develop-</p>

Country	Criteria	Description
		<p>ment of the Environmental Impact Study and execution of the Project Environmental Management Plan. The latter includes implementation and follow-up of mitigation and compensation measures and periodic reports to the Ministry of the Environment. Only after obtaining the Environmental Discharge is the project proponent then released from its environmental liability.</p> <p>The Malagasy Mining Code recognises the “polluter pays principle”, i.e. the liability of the originator of an adverse impact on the environment. The environmental rehabilitation obligation of the polluter remains until an Environmental Discharge is obtained from the responsible authority (which follows after the on-site review and report on the completion of rehabilitation works).</p>
	Financing	<p>According to Art. 11 of the Environmental Charter, the project promoter bears the costs for the development of the Environmental Impact Study and execution of the Project Environmental Management Plan.</p> <p>At a local level there are singular examples of systems of payments for environmental services established by NGOs to pay villagers for the protection and enhancement of natural resources.</p> <p>Other than these examples, no specific instruments for financing were noted.</p>
Mexico	Legal Situation	<p>The Civil Code in Art. 30 regulates the reparation of environmental damage.</p> <p>The Biodiversity Code aims to systematically integrate all legal dispositions that relate to environmental issues. General objectives include: the promotion and regulation of sustainable use, and the conservation, remediation, rehabilitation and restoration of natural resources. The obligation to carry out an EIA for any activity that causes grave or irreparable damage to the survival of a species are mandatory under the Biodiversity Code and the General Act on Ecological Equilibrium and Environmental Protection (LGEEPA). The latter also includes provisions for voluntary compliance measures: environmental audits may be undertaken to design preventive and remedial measures for the protection of the environment.</p>
	Instruments	<p>The most efficient instruments in Mexico for conserving biological diversity are the Natural Protected Areas, in particular the Federal Program for Natural Protected Areas.</p> <p>In Natural Protected Areas a Resource Management Plan, which must be designed with the active participation of the local communities, restricts activities in the buffer and transitional zones of biosphere reserves.</p> <p>EIA is a major tool for addressing biodiversity compensation issues related to project development. According to the magnitude of the impacts projects are classified into three categories, which require different types of EIA: regional EIA, specific EIA or only a Preventive Report.</p> <p>There is an increasing number of voluntary compliance measures seeking to achieve environmental and ecosystem protection. Examples include environmental audits, certification aimed at achieving international environmental management standards according to ISO 14000 and the FIDE Seal for Electric Energy Savings.</p>

Country	Criteria	Description
		<p>In 2003 the National Biodiversity Commission established the Program for Environmental Restoration and Compensation, which aims to restore or recover ecosystems and natural resources that have been damaged or suffered deterioration for a variety of causes.</p>
	Mitigation hierarchy	<p>According to the Civil Code the reparation of environmental damage includes: 1. restitution of the damaged good or a payment, if restitution is impossible, 2. indemnification for the material and moral damage caused, including payments for consequences such as the recovery of health, and 3. recompense for all damage caused.</p> <p>In addition, the Biodiversity Code states that the environmental authorities must ensure that negative impacts of projects on wildlife and habitats are avoided, prevented, minimised, repaired or compensated.</p> <p>In the course of the EIA the mitigation hierarchy is applied, seeking to identify prevention, mitigation and compensation measures for impacts caused by any works and activities of public or private nature. This includes considering alternatives. According to the LGEEPA the environmental report must contain a description of preventive and mitigation measures. The latter are defined as the totality of actions that the project promoter has to implement to mitigate the negative impacts and to re-establish the environmental conditions that existed prior to the project or to compensate for them.</p>
	Compensation	<p>The mitigation and compensation measures are laid down in the Environmental Management Plan, which contains a mitigation programme, including mechanisms and actions to minimise the negative environmental impacts during construction, operation and closure of projects, a compensation programme, including compensation measures to reconstitute the environment (e.g. reforestation programmes), and a follow-up programme to verify the environmental performance of the project.</p> <p>Article 2.306 of the Biodiversity Code stipulates that when the in-situ reparation of environmental deterioration is not possible, it will instead be subject to an indemnification. The payment will be issued to the Biodiversity Restoration and Preservation Fund.</p> <p>Within the Program for Environmental Restoration and Compensation measures to avoid or mitigate damage elsewhere (off-site, out-of kind) are applied, if recovery or compensation are impossible. This is done through the support of relevant projects and programmes, as dictated by the general priorities of the programme.</p>
Liability / responsibility	<p>Art. 5.91 of the Biodiversity Code obliges any person causing damage to wildlife or its habitat to repair that damage. The reparation of damage comprises the reestablishment of conditions that existed prior to the impact, and if this is not possible, the payment of an indemnification that will be used for the development of programmes, projects and activities aimed at restoring, conserving and recovering species and populations, as well as monitoring.</p> <p>Similar to the provisions in the Biodiversity Code the LGEEPA establishes responsibility to repair damage resulting from the contamination or deterioration of the environment or any impairment of natural resources or biodiversity. The principle of responsibility for environmental damage is not only aimed at obliging the polluter to repair damage caused, but also to pre-</p>	

Country	Criteria	Description
	Financing	<p>vent and avoid future damage.</p> <p>In the field of EIA the LGEEPA foresees the payment of economic guarantees (environmental insurances and guarantees) that are used and established in projects for which significant environmental impacts have been identified, in order to ensure environmental protection or the reparation of damage. Art. 2.308 of the Biodiversity Code empowers the Ministry of the Environment to demand these insurances or guarantees.</p> <p>Furthermore, the Biodiversity Code stipulates the creation of the Biodiversity Restoration and Preservation Fund, to which compensation payments are issued and which serves as complementary financial support, in cases where the scope of reparation can be neither covered by the aforementioned insurances nor by the project proponent.</p> <p>The National Forestry Commission has initiated the Program for Payments for Environmental Services, which focuses on carbon capture, biodiversity conservation and agroforestry.</p>

8 Conclusion

8.1 Output of the study and obstacles encountered

During the study several hundred documents were identified (mostly through the internet), assembled in a database and analysed (>500 for the five countries of the main investigation in English, French, Spanish, and Portuguese). Additionally, more than one hundred documents of general scientific literature in German and English were evaluated. A large number of documents were also reviewed during the pre-investigation in English, French, Spanish, Portuguese, German, Russian, Chinese, Korean etc.).

To supplement and verify the information gathered in this manner, several experts in different countries were contacted. They contributed via (telephone) interview or filled out a questionnaire and / or supplied information and comments via email.

Preliminary results and findings for this study were presented to the public during COP9 in May 2008 in Bonn. Further presentations will be made in order to discuss the results in professional circles, e.g. the BBOP network.

During the study a number of obstacles were encountered, associated with the chosen methods. These must be considered when discussing the findings.

First, it is important to note that the chosen medium for the research, the internet, may only present a fragmentary spotlight on the situation in the examined countries. Some information may not be accessible via internet sources and it is possible that only certain points of view are presented (e.g. discussion in the scientific community, but not implementation in practice).

Furthermore the information overload of the internet made it difficult to extract only relevant information. Even though the formulated search inquiries helped to filter the information, this remained a major challenge. Moreover, although a considerable number of relevant documents were identified, the content was rarely precisely focused on the study's research themes.

Another obstacle encountered was the fast rate of change of information on the internet; in this dynamic system changes occur from one day to another (or faster), with 'new' information available and 'old' information deleted.

Language restrictions were reduced to a minimum. Most information was indeed available in English, but as might be expected, more specific information was available in the national languages. Therefore, in the case of Egypt (and maybe also Madagascar) important information might not have been identified (as Arabic and Malgasy were not included in the research languages).

The different terminology used for impact mitigation approaches in different countries was another obstacle to the identification and analysis of these approaches.

Finally, the identification of and contact with experts was challenging and time-consuming. Several dozen persons were contacted via email. However, only a very limited number responded (typically after a further email reminder). Furthermore, several experts were not able to contribute due to a lack of time or specific knowledge and experience of the study's themes that are less well known in some countries relative to the situation in, for example, Germany.

8.2 Crucial Questions

Which approach best addresses biodiversity?

“The” best approach does not exist. Each of the encountered approaches has certain strengths and weaknesses, some more, some less. Additionally, it is impossible to simply “export” an approach unmodified to another country, as different circumstances may lead to its failure.

Nevertheless, certain impact mitigation regulation approaches can indeed serve as examples to enlighten worldwide discussion. The German Eingriffsregelung for instance, is already at an advanced stage and has been practically applied for many years. Thus, there is a big interest in learning from the German experience and developing compensation approaches according to the Eingriffsregelung and its methods (e.g. South Korea, Japan, Sweden, Finland, etc.). Another long-standing example is US Wetland Mitigation that, for example, more strongly regulates follow-up and performance reviews. More recently, the Malagasy MEC, as an equivalent to an EIA for existing facilities, and the Brazilian Environmental Compensation Fund can be noted.

If the whole approach is not transferable, at least chosen aspects may be used in other countries. In this respect, the Environmental Compensation Fund in Brazil for example may serve as a suitable tool to facilitate the implementation of compensation measures and to assure the appropriate use of compensation payments. However, it should ideally be combined with sound technical standards, in order to avoid misuse. Thus, when designing new biodiversity offsets the strengths and benefits of different compensation approaches may be combined to respond appropriately to the specific situation in a country.

How to balance biodiversity loss and the required compensation (valuation of biodiversity)?

The valuation of biodiversity is still one of the major tasks for the near future. The definition of common criteria and general methods and procedures is currently lacking. There are numerous more or less complex approaches for the valuation of biodiversity, which generate completely different results, even in one country. In Germany at least 42 published evaluation approaches exist, e.g. biotope value approach (“Biotopwertverfahren”) and restoration cost approach (“Herstellungskostenansatz”). Some of them contain contradictory elements and thus, there is an ongoing discussion as to which is most applicable and / or realistic and can best address biodiversity concerns.

Biodiversity is valuable all over the globe and measuring should be comparable and transparent. Therefore a framework is required which sets up general principles for valuation. Within this framework the specific definition of different valuation approaches that can be adapted to the situation and needs of different countries can take place. The CBD may play an important role in providing general guidance to develop this framework.

How can social and economic mechanisms be integrated in the compensation process?

In the German context, this concern is of minor relevance (impact mitigation regulation is mandatory and functions relatively well).

However, in developing countries the integration of social and economic mechanisms is particularly crucial, as they cannot be separated from environmental matters. Approaches were noted in several countries, where economic, social and cultural concerns are integrated, especially in EIA systems, e.g. Environmental and Social Impact Assessments in Madagascar. Furthermore, the EIA guidelines in different countries require consideration of the human or socio-economic environment when undertaking an EIA (see Chapter 7.2).

Reference can also be made to the CBD, which explicitly includes social and economic issues (notably with respect to Access and Benefit Sharing).

From the opposite perspective, economic and social instruments may facilitate the implementation of biodiversity compensation. Economic mechanisms and (financial) incentives play an increasing role (payments for environmental services, carbon credits, etc.). Social mechanisms may also contribute, e.g. in the case of the Rio Tinto ilmenite project in Madagascar, a DINA, a traditional Malagasy social contract, regulated the respective roles and responsibilities of the signatories in the compensation process.

Enhancement vs. preservation: is preservation already compensation?

The central question is what the (physical and financial) compensation measures are used for. Negative uses include cases where monetary compensation measures are merely used for the management and maintenance of existing protected areas, as because this would not generate an additional net gain to counterbalance the loss, undermining the “no net loss principle”. It must be ensured that biodiversity offsets are not merely financing tools for general nature conservation duties (i.e. biodiversity offsets should not replace conservation and other obligations of governmental bodies). Therefore, the preference for in-kind (“like-for-like”) over out-of-kind measures and of on-site over off-site measures has to be highlighted (German Eingriffsregelung, US Wetland Mitigation).

The “no net loss principle” requires that biodiversity offsets are established in relation to the impacts and the affected area. From the German perspective, preference is given to in-kind restitution (“like-for-like”) and therefore, compensation measures primarily have to be executed on-site. Only as a second step are off-site and out-of-kind measures allowed, and only as a last resort should compensation payments be implemented (and only in order to ensure compliance with the no net loss principle). Similarly, while the US Wetland Mitigation requires offsets to be implemented within the same watershed, the German Impact Mitigation Regulation refers to the same natural landscape unit.

However, under certain circumstances functionally and spatially disconnected compensation measures or compensation payments may take place or may even be preferable. This can be the case for example when by doing so a greater overall environmental benefit is created (“trading up”), or when it is impossible to realise on-site and in-kind compensation measures. Nevertheless, for this purpose a strict framework is needed in order to assure that, for example, compensation payments are used appropriately for the benefit of biological diversity and natural resources.

Can compensation be cut down on major projects (road planning, mining, etc.) or do we need an overall approach to combating biodiversity loss?

Compensation for environmental impacts mostly focuses on major projects. An overall approach in many countries is simply not feasible, at least not yet. Even though the aim should be to establish an area-wide compensation approach, this can only be done as a sequential process. This was underlined by several of the experts contacted. As a means of establishing biodiversity compensation as a valid approach, the initial focus on major projects is valid as they have the benefits of (usually) a limited number of responsible parties and higher anticipated compensation outcomes. However, this should be seen as a first step and in the future, mechanisms need to be established to address not only the impacts of major projects but also medium- and small-scale impacts. This is in particular important as cumulative impacts are a problem, especially in the context of traditional use and the activities of local populations (logging, hunting, etc.). An exception is the German Eingriffsregelung which follows a comprehensive (area-wide) approach, covering both projects at land use and sectoral planning level.

Apart from this at present, there is a lack of regulations that are legally binding with respect to liabilities for these impacts. Therefore these small-scale impacts currently have to be addressed differently in order to

halt biodiversity degradation and loss (which is an absolute necessity!). Alternative solutions are already working in some places. Again this may be for example payments for environmental services (see the Proambiente Program, Chapter 6.2.8) and carbon offsets, tangible projects, private initiatives, funding mechanisms and (financial) incentives.

What is the role of the CBD regarding impact mitigation regulation and compensation?

Whereas some countries already had an interest in biological diversity and had already established mechanisms e.g. for environmental compensation (e.g. Brazil, USA, several European countries, including Germany) before the CBD was introduced in 1992, for others the CBD served as a catalyst encouraging the development.

The goal of the CBD is to mainstream biodiversity issues into the politics and planning of countries that have ratified the convention. Even though this cannot be achieved yet for all countries, with the national reports at least an overview is given of the current situation. The national reports include a large number of questions, amongst which are some related to impact mitigation. These reports are important tools in gaining insights into the situation in different countries. The fourth national report phase will start soon.

The second step, after the information-related actions have been completed and projects are initiated, is to seek compliance with the objectives of the convention. The CBD should establish a worldwide platform, coordinating information exchange and promoting best practice examples. Furthermore, this platform should provide guidance on different aspects of biodiversity e.g. methods and procedures for the valuation of biodiversity and impact mitigation.

Additionally, the overall role of the CBD is to contextualise impact mitigation and compensation in the broader context of biodiversity, climate change and socio-cultural issues (e.g. Access and Benefit Sharing) etc.

Which conclusions can be drawn for the German Eingriffsregelung? (Are we living on an island in the sun or is IMR a growing issue even in developing countries?)

The worldwide comparison of compensation approaches underlines the inalienability of the German Eingriffsregelung. It is not only important nationally in Germany but also at an international level. Therefore it should be better promoted worldwide in order to make existing knowledge and experiences available to other countries and to avoid “reinventing the wheel” (in South Korea for instance the German Eingriffsregelung is being discussed as to its applicability in Korean context).

The strength of the Eingriffsregelung lies in its comprehensive (area-wide) approach, which is independent of EIA and is applied to all kinds of impacts, including those that are small-scale. Moreover, the Eingriffsregelung includes a “real” no net loss principle as it does not accept mere preservation actions as compensation measures.

However, there are some suggestions and concepts from other compensation approaches worldwide that could be integrated into the discussions on several controversial issues. Among these are most notably the valuation of biodiversity (including the concept of a compensation ratio) and ensuring long-term effectiveness of compensation measures (management, monitoring and follow-up).

8.3 Assumptions for further research

As a result of the study, a number of assumptions have been identified. These may be subject to further investigation in subsequent projects.

- 1) **Outstanding role of EIA:** In a worldwide context the most commonly encountered instrument in relation to compensation is the EIA in its pure form or several other variations e.g. Environmental and Social Impact Assessment (ESIA).
- 2) **Restriction to major projects:** At present, compensation approaches are usually applied to the impacts of major projects (EIA for major projects) and thus small-scale impacts, which may generate a significant cumulative impact, are not yet addressed.
- 3) **Existing facilities:** Not only the construction of new projects but also the operation of existing facilities may generate significant impacts on biological diversity. These are not yet covered by compensation approaches.

In Madagascar this is already addressed with the Adaptation of Conformance as one tool of the EIA.

- 4) **Valuation and balancing of biodiversity:** The valuation of biological diversity on one side and potential impacts on the other still remains a major task for the near future.

In the German national context this discussion has been ongoing for many years showing huge differences.

- 5) **Conceptual approach of mitigation schemes:** In general, compensation for impacts on biological diversity is not consistently defined. Usually it is placed in a larger context and sometimes only referred to “between the lines”. Impact appraisal and mitigation schemes often follow a conceptual approach trying to cover all possible aspects (e.g. social, cultural etc.) instead of focusing on flora, fauna and ecosystems.
- 6) **Compensation and conservation:** The boundaries between compensation, voluntary offsets and preventive measures are often not strict. Effective and sustainable offset management schemes usually include restoration and compensation measures as well as conservation measures, e.g. the establishment of conservation zones or protected areas.
- 7) **Adherence to the mitigation hierarchy:** The mitigation hierarchy is not always clearly applied. While avoidance (or prevention), restoration (or rehabilitation) and compensation (or indemnification) steps are typically formally established, these do not necessarily follow a linear sequence, instead existing in parallel, making it difficult to distinguish between them.

The integration of mitigation and compensation measures has been noted e.g. in EIA practice in Madagascar.

- 8) **Case-by-case approach:** Compensation measures are often developed using a case-by-case approach.
- 9) **Environmental management:** Environmental management plays an important role in restoration and compensation, as well as for preventive (general) purposes. It helps to strengthen the efficiency of such approaches and measures.

For example, in Egypt eight Regional Branch Offices (RBOs) of the responsible environmental authority EEAA are established throughout the country as part of the Agency’s policy for decentralisation of environmental management. Additionally, Environmental Management Units (EMUs) have been established in 26 Governorates around the country to address environmental issues at

the local level in coordination within the RBOs. (Government of Egypt; United Nations Development Programme n.d.: 4).

- 10) **Monitoring and follow-up:** Emphasis must be placed on the importance of monitoring, follow up and long-term environmental management plans in tackling the lack of mitigation and compensation measure implementation and in ensuring the measures long-term effectiveness.

This is an important issue that is being discussed both worldwide and specifically in Germany.

- 11) **Lack of liability:** Even though the “polluter pays principle” is recognised in many countries, a problem that is often encountered in practice is that the liability for environmental degradation is not assigned to a responsible individual, company or group of individuals, leading to the problem of high external costs through “common” or “public” environmental damage.
- 12) **Compensation funds to address negative externalities:** The implementation of compensation funds offers a possible means of addressing negative externalities (i.e. environmental hazards and impacts with no clear or common responsibility). The best case may be the result of concerted action on the part of public sector institutions (political and administrative bodies, NGOs) and private sector organisations (companies).

Examples include the Mexican Fund for Environmental Reparation and the Egyptian Environment Protection Fund.

- 13) **Financing for compensation measures:** Financing is a challenge that is addressed differently. Compensation funds seem to be a suitable solution to the need to provide appropriate amounts of money in a short period of time.
- 14) **Incentives and payments for environmental services:** Payments for environmental services (e.g. ensuring water quality, maintenance and plantation of forests) and other (financial) incentives are suitable tools to support the prevention and compensation of small-scale impacts (e.g. farming, logging, use of natural resources by the (local) population).

Examples have been noted in different countries, e.g. the Proambiente Program in Brazil.

- 15) **Land tenure:** The compensation process is faster and easier when the land is owned either by the state or by the project proponent or company seeking to offset.

In the Yacyretha hydroelectric project for instance, compensation measures were implemented more easily in Argentina than in Paraguay, because the land was already owned by the government.

- 16) **Ensuring no net loss:** Compensation approaches usually aim to ensure no net loss of biodiversity. Contrary to some examples (in Brazil compensation payments are used for the establishment and maintenance of protected areas) this cannot be achieved through mere preservation measures (e.g. maintenance of protected areas), but requires an enhancement to counterbalance the loss.
- 17) **Private sector initiatives and voluntary offsets:** The interplay of public administration and the private sector is a key element in successful environmental offsetting when considering all steps of the mitigation hierarchy. The private sector is playing an important role. Voluntary biodiversity offsets are especially important where the legal basis and general guidance are lacking. However, voluntary offsets have also been noted as complements to mandatory approaches in some cases.

In Egypt some businesses, particularly in the energy and tourism sectors, have established special departments and field units to provide external support on environmental issues (Government of Egypt; United Nations Development Programme n.d.: 6).

- 18) **Eco-certification:** The number of voluntary initiatives to obtain international environmental certification (e.g. EMAS) is increasing. These may encourage voluntary biodiversity offsets and are an efficient complement to mandatory impact mitigation.
- 19) **Role of “global players”:** Multi-national companies are key players in designing and implementing the concept of biodiversity compensation. On the one hand there is a growing pressure to meet environmental and social demands and to show environmental responsibility and on the other they can act as an important link between different regions of the world by shifting good practice approaches to countries with lower environmental standards. In this sense they can have an important function as a multiplier of new approaches (or approaches that exist elsewhere).

In the case of the QMM ilmenite mining project in Madagascar, the corporate environmental policy and the commitment to biodiversity of the Rio Tinto Group pushed the implementation of compensation measures forward.

- 20) **Mining sector:** The mining sector plays an important role within the scope of discussion about compensation. Generating a huge threat both to biological diversity and to local communities, mining projects are exposed to the attention of a broad public. Despite the struggle between economic interests on the one hand and ecological and social needs on the other in the response has been a considerable number of legal administrative provisions as well as initiatives at an international level.
- 21) **Market-based instruments (MBA):** In some countries market-based instruments already play an important role even in biodiversity compensation, e.g. Biodiversity Banking (New South Wales, Australia), Bush Tender / Broker Scheme (Victoria, Australia), Wetland Mitigation Banking (USA). There is a potential that such instruments could be implemented elsewhere in the near future. In several countries wetland mitigation schemes are under development (e.g. India and Pakistan). In Europe there is currently a discussion about the more intensive use of market-based instruments to reach environmental goals (EEA 2006, European Commission 2007).

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